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Special Report: New Turin Shroud Claims

# Skeptical Inquirer

THE MAGAZINE FOR SCIENCE AND REASON

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# Millennium Thought Contagion

## Astrology Responds to Skeptics

## The Physics Behind the Magic

## Another Lunar Effect Put to Rest

## The Universe and Carl Sagan

Published by the Committee for the Scientific Investigation of Claims of the Paranormal

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*Few people ever extolled the wonders of science with more eloquence or were as effective in defending reason and campaigning against pseudoscience as Carl Sagan. A polymath prodigy and visionary interdisciplinary scientist with lifelong passions for planetary astronomy, the origins of life, and seeking extraterrestrial intelligence, Sagan turned his early enthusiasms about UFOs to rigorous but open-minded skepticism. An excerpt from a new biography,* Carl Sagan: A Life.

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HAVEN SWEET

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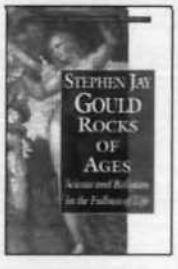


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## EDITOR'S NOTE

# *The Cosmos of Carl Sagan*

I don't remember exactly when I first became aware of Carl Sagan. It must have been the late 1960s when I read his book *Intelligent Life in the Universe*, written in a unique collaboration—they hadn't met—with the famous Soviet astronomer I.S. Shklovskii. The young Sagan had taken a translation of Shklovskii's book and added his own abundant emendations, identified by triangular symbols. The book crackled with vivid ideas.

In 1973, his book *Cosmic Connection* was published to wide acclaim, and Sagan started getting wide renown. While editor of *Science News*, I went to a colloquium he gave at the nearby NASA Goddard Space Flight Center in Maryland. That's when I first heard him respond to questions about UFOs with insight and wit. There was underway at the time a periodic spate of UFO reports, "UFO *flap* is, I believe, the technical term," said Sagan wryly.

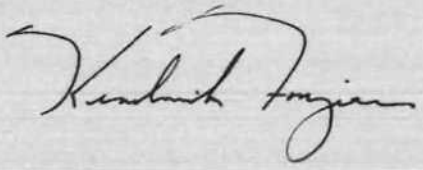
When Sagan and Immanuel Velikovsky met in debate at an extraordinary symposium (which Sagan had championed) at the annual meeting of American Association for the Advancement of Science in San Francisco in 1974, I sat near the front with other science journalists. Sagan had done his homework well (he spoke from a 56-page typewritten manuscript heavily annotated with his handwritten changes). It was an epic clash: the elderly, silver-haired Velikovsky, looking like some kind of modern Moses invoking pinball-like planetary collisions and flybys to explain Biblical miracles, the young and darkly handsome planetary scientist Sagan calmly and deftly applying reasoned argument, celestial mechanics, and the best physical science to counter the sensational claims.

In 1976 Sagan became one of the original founding Fellows of the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), publisher of the SKEPTICAL INQUIRER, and to the end he remained committed and supportive in our mutual battles on behalf of good science and against pseudoscience and unreason.

In this issue, we are pleased to present excerpts from Keay Davidson's sparkling new biography of Sagan, *Carl Sagan: A Life*, just published in October. Our excerpts focus mostly on Sagan's scientific interests in the origins of life, extraterrestrial intelligence, UFOs, and skepticism (including his clash with Velikovsky). But they also give some of the flavor of the book's portrayal of Sagan's enigmatic personality, his often bumpy relationships with colleagues, and his extraordinary, but regrettably foreshortened, life and career as a visionary interdisciplinary scientist and powerfully effective public expositor about science and its values.

* * *

This issue also presents a Readers' Forum on Science and Religion, a sampling of readers' responses to our recent special issue Science and Religion: Conflict or Conciliation? The response to that issue has been extraordinary. It has also been overwhelmingly positive. We received so many letters that there is no way we could publish anything but a representative selection. We had hoped to publish more, but space prevents it. But there's good news: Some of the responses that didn't make it into this issue will be placed on our Web site at www.csicop.org. We thank you for all your very thoughtful comments. We clearly tapped into a strong current of interest and concern.

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# Space.com's CIA-UFO Cover-up Mixes with News on Web

PHILIP J. KLASS

It is hardly surprising that the many Internet Web sites dedicated to UFOs offer a very biased view that appeals to "UFO believers." What is surprising is that the recently created Space.com Internet site is offering a mix of mostly legitimate space science/technology news with some UFO nonsense. Space.com disguises its UFO coverage under the name "Area 51" (part of Nellis Air Force Base in Nevada), where some UFOlogists claim that captured flying saucers are being flight tested.

For example, on August 20, 1999, Space.com offered credible features headlined: "Astronomers Discover Distant Brown Dwarf" and "Satellite Captures Images of Devastating Refinery Fire in Turkey."

But its Area 51 section feature was headlined: "CIA Rues UFO Cover-up," a grossly misleading article by Space.com staff writer Robert Scott Martin.

Martin's article began: "*Not only has the U.S. Central Intelligence Agency admitted its role in trying to 'correct' public opinion about UFOs over the last half century*, it now believes the policy caused 'major problems' in dealing with the public. In an internal report entitled 'CIA's Role in the Study of UFOs, 1947–90,' agency historian Gerald K. Haines *portrayed the CIA as consistently and deliberately working to suppress reports of unidentified aerial phenomena since modern UFO sightings began with the Kenneth Arnold case of 1947*" (emphasis added). Both of the foregoing (italicized) claims are false. They are based on Martin's paranoid misinterpretation of a report by CIA historian Haines which was first published more than two years ago but only recently "discovered" by the UFO media. Haines explained the genesis of his 1997 report as follows: "In late 1993, after being pressured by UFOlogists for the release of additional CIA information on UFOs, Director of Central Intelligence R. James Woolsey ordered another review of all Agency files on UFOs. . . . What emerges from this examination is that, *while the Agency concern over UFOs was substantial until the early 1950s, CIA has since paid only limited and peripheral attention to the phenomena*" (emphasis added).

The CIA historian's account would have been more accurate had he reported that Agency interest in UFOs was "slight until mid-1952" when the White House requested the CIA to make an independent assessment of the then U.S. Air Force conclusion that all UFO reports had prosaic explanations. The White House request resulted from the report of UFOs over Washington D.C., based largely on mysterious "blips" on the National Airport radar. The U.S. Air Force initially suggested that the UFO blips were the result of a temperature-inversion—later confirmed by a Federal Aviation Administration investigation. But the widespread media coverage and doubts about the USAF explanation of the incident prompted the White House request to the CIA.

The foregoing information on what briefly spurred active CIA interest in UFOs in mid-1952 was disclosed in approximately 1,000 documents the Agency released in late 1978 in response to a Freedom Of Information Act (FOIA) request. Some of the documents, such as those dealing with the CIA's response to the White House request, were previously classified "Secret." (Highlights are detailed in my book *UFOs: The Public Deceived*, published by Prometheus Books in 1983, which is frequently cited as footnote references in the Haines report.)

In mid-1952, there were a few people within the CIA who wanted to obtain National Security Council authorization for the Agency to launch its own UFO investigatory effort, but others were opposed.

To resolve this issue, it was agreed that a panel of five top scientists, headed by Dr. H.P. Robertson of the California Institute of Technology, would be convened in early 1953 to examine the most impressive UFO cases.

The Robertson Panel unanimously concluded that the best UFO reports offered no evidence that any UFOs were either extraterrestrial or Soviet craft. But, as the Haines report noted, the panel did express concern "that potential enemies contemplating an attack on the United States might exploit the UFO phenomena and use them to disrupt U.S. air defenses" or to induce "hysterical mass behavior." For this reason, the panel's report was classified "Secret." Additionally, several panel members did not want it made public that they served as CIA consultants.

The Haines report stated that the panel recommended that the National Security Council—not the CIA—institute a policy of public education (possibly including a Walt Disney movie) to reassure the public that UFOs had prosaic explanations. But no such government-sponsored program was ever funded. The task of educating the public fell to the U.S. Air Force's Project Blue Book office, which was responsible for investigating major UFO cases and trying to find prosaic explanations.

There is not an iota of evidence in the Haines report to support Martin's claim that the CIA "consistently and deliberately work[ed] to suppress reports of unidentified aerial phenomena." This was a practical impossibility because the CIA has no means to control what is published and broadcast by the news media.

For the six years prior to 1953, a yearly average of slightly less than 400 UFO sightings were reported to the United States Air Force (USAF). From 1953 until the USAF closed down its Project Blue Book UFO-investigating

office in 1969, the yearly average number of UFO sightings reported to the USAF was more than 600—an increase of more than 50 percent.

In the third paragraph of the Space.com story, Martin implies that Haines is withholding some significant UFO data: "Still, even in a [Haines] paper filled with covert attempts on the part of both the CIA and the Air Force to 'persuade the public that UFOs were not extraordinary,' *Haines himself continued the suppressive policy, perhaps unconsciously, by writing that the CIA 'paid only limited and peripheral attention to the [UFO] phenomena' since the early 1950s*" (emphasis added).

Martin ignores specific examples cited by Haines that show the CIA's minimal interest in UFOs after the early 1950s. For example, after the Robertson Panel report, the CIA assigned responsibility for keeping abreast of the UFO situation to its Physics and Electronics Division, headed by Todos M. Odarenko. Instead of being pleased, Haines reported, "Odarenko sought to have his division relieved of the responsibility for monitoring UFO reports. In 1955, for example, he recommended that the entire project be terminated. . . ."

The Haines report said: "Agency officials felt the need to keep informed on UFOs *if only to alert the Director of Central Intelligence* to the more sensational UFO reports and flaps." But the Martin story distorts this to read: "Even though the agency itself had a declining interest in UFO cases by the late 1950s, *it was still spending considerable resources looking out for the more sensational UFO reports and 'flaps' in order to suppress them*" (emphasis added).

Still more spurious attributions to the Haines report are found in the concluding portions of Martin's article.

For example: "At the end, Haines concluded, the tactics of silence and repression were a failure. The UFO issue probably will not go away soon, no matter what the agency does or says. The belief that we are not alone in the universe is too emotionally appealing. . . ." Haines did not make any such reference to "tactics of silence and repression." Rather, his closing statement was: "Like the JFK assassination conspiracy theories, the UFO issue probably will not go away soon. . . ."

*Philip J. Klass is a long-time UFO investigator and CSICOP Fellow.*

The November 3, 1994, eclipse as seen from Chile. (NASA)

## August 11 Eclipse Feeds Superstition, Fears

The last total eclipse of the twentieth century came and went without disaster, despite nervous religious apocalyptics of all faiths.

For months, apocalyptic Christians have been flocking to Jerusalem to be in the Holy Land at the turn of the millennium. To many there, the August 11 eclipse was additional evidence that the end is near. According to a CBS news report, one woman awaited Christ on the Mount of Olives, saying, "The Bible says there will be signs in the heavens." Another waiting believer said, "The eclipse goes together with everything else in the sky. To me, it means that something is coming about." Such beliefs can be fed by Biblical passages such as ". . . And the sun shall be darkened, and the moon shall not give her light. . . ." (Matthew 24:29).

Many find the year 2000 significant because of our ten-based number system and our penchant for finding significance in round numbers. But nothing in the Bible suggests that the Second Coming (or any other cataclysmic event) will occur on the millennial anniversary of Christ's birth.

In some areas in India, pregnant women were told not to leave their homes during the eclipse, lest their unborn children be blinded. Other Indians believed that anyone holding a sharp object during the eclipse, such as a knife or axe, would be cut by the object.

No doubt the earthquake in Turkey a week later, coupled with the beginning of the Caribbean hurricane season and tropical storm Dennis, only fed the fires of fear in doomsayers throughout the world.

*—Benjamin Radford*

*Benjamin Radford is Managing Editor of the* SKEPTICAL INQUIRER.

## False Memory News

A woman who said her therapist convinced her she had been raped by a satanic cult and had killed an infant was awarded $200,000 by a California jury on June 21, 1999. Ms. Leah Strout Simpson began seeing therapist Roger Litwin in 1986, when she was in her early twenties. Although Simpson did not initially relate stories of satanic abuse, Litwin treated her for multiple personality disorder. Simpson came to believe she had been involved in ritual abuse and murder, and became suicidally depressed. She finally realized that what she thought were long-repressed memories were in fact untrue, an artifact of her treatment. The jury held Simpson to be 35 percent at fault for what happened to her. Litwin's lawyer said that his diagnosis and treatment were within accepted professional standards.

Two months later, on August 30, the California Supreme Court opened the door for prosecutors to try alleged child molesters for crimes they are accused of

committing decades ago. The ruling upheld a 1994 state law that allows molestation charges to be filed within a year of the case being reported to authorities, regardless of when the crime occurred.

Justice Marvin Baxter's majority opinion noted that "young victims often have difficulty remembering and reporting traumatic abuse at the hands of adults. . . ." This statement contrasts sharply with the professional opinions of many psychologists critical of recovered memories, who say that in fact people who experience traumatic events typically have difficulty *forgetting* the events, not remembering them.

The ruling allows prosecutors to file charges only when the accusation is corroborated by independent evidence, excluding a psychiatric opinion. Nevertheless, a representative of California Attorneys for Criminal Justice, Charles Sevilla, said that ruling would lead to prosecutions based on dubious evidence, especially the scientifically questionable theory of recovered memory.

*—Benjamin Radford*

## 'Intelligent Design's' Chinese 'Deep Throat'?

In the wake of the Kansas decision, Berkeley law professor Phillip E. Johnson, one of the most visible critics of evolution, wrote a column in the August 16, 1999, *Wall Street Journal* ("The Church of Darwin"). In it, Johnson, an outspoken advocate of "intelligent design" theory, the latest incarnation of creationist strategy, mentioned a "Chinese paleontologist" who, he said, "lectures around the world saying that recent fossil finds in his country are inconsistent with the Darwinian theory of evolution."

Physicist David E. Thomas, president of New Mexicans for Science and Reason and a SKEPTICAL INQUIRER contributing editor, wrote what he describes as a cordial note to Johnson asking him who the Chinese paleontologist is and if he has published any articles Thomas could look at, for example in *Science*, or any other accessible journals or books.

On August 30 Johnson replied. He told Thomas he's not releasing the scientist's name in case someone wants to make trouble. Also, he said, the scientist hasn't published anything in English yet.

"My jaw dropped," says Thomas. "I'd expect a 'Deep Throat' in politics—but in science?"

"Johnson and the anti-evo crowd can cite a 'scientist' in the *Wall Street Journal*, creating an authority out of whole cloth, without so much as a single article or report to examine, much less a real person. Many creationists are already citing this very *Wall Street Journal* article as evidence of scientific opposition to Darwin; for example, see columns by M.D. Harmon (*Portland Press Herald*, August 23) and Darrell White (*Baton Rouge Advocate*, August 28)."

*—K.F.*

## The Monkey Business in Kansas

The governor called it an embarrassment to the state. Media reported it worldwide. Op-ed page columnists pontificated. Editorial cartoonists lampooned. Scientists and educators lambasted it. Creationists welcomed it. Politicians waffled. Civil libertarians threatened suit.

A *Washington Post* columnist even wrote a biting and hilarious "memo from God" to those who made the decision saying, "Man I gave a brain. Use it, okay?"

When the Kansas Board of Education, in one of the most far-reaching efforts yet by creationists to challenge the teaching of evolution in

John Trever, *Albuquerque Journal*

## VP Gore Sidesteps, Backtracks, Stumbles Forward

When presidential candidates campaigning in Iowa were asked their views on the Kansas decision, most seemed confused, and none came out with a clear statement supporting good science. Several supported creationism. Then physicist Robert Park's "What's News" electronic newsletter, published by the American Physical Society, asked Vice President Al Gore's presidential campaign office for Gore's reaction, and his spokesperson dodged behind local control. The next week Reuters posed the same question: "The Vice President favors the teaching of evolution in public schools," the spokesman replied. Unfortunately he didn't stop there. "Obviously that decision should and will be made at the local level, and localities should be free to teach creationism as well," he added.

"Gasp!" exclaimed Park. "The Supreme Court ruled that unconstitutional in 1987. Informed of that, the spokesman called Reuters several hours later with a clarification: 'The Vice President supports the right of school boards to teach creationism within the context of religious courses and not science courses.'"

—*K.F.*

schools, voted to delete virtually any mention of evolution from the state's science curriculum, the decision set off a firestorm of national commentary and debate and brought the political power of the creationist movement at the local level into bold and ugly relief.

The Kansas decision deleted not only most references to biological evolution but also references to the Big Bang theory, a hallmark of modern cosmology.

The action exemplifies the efforts of creationists in the United States to delete virtually all mention of evolution in science curricula and to present an image of evolution—in contrast to all facts—as a marginalized theory with little scientific support. This became their tactic after a series of court decisions repeatedly declared the teaching of creationism unconstitutional.

The National Academy of Sciences, the nation's foremost organization of scientists, calls evolution "the most important concept in modern biology, a concept key to understanding key aspects of living things," but creationists and their sympathizers in the public have increasingly been successful at the local and sometimes the state level in ignoring all pleas from scientists and educators for what makes for good science.

The Kansas controversy goes back more than a year to when a Kansas Science Education Writing Committee, a panel of twenty-seven scientists and professors co-chaired by John Staver and Loren Lutes, began drafting a state version of new national science-teaching guidelines. According to Staver, their work embraced the vision and content of the *National Science Education Standards* (National Research Council, 1996) and *Benchmarks for Science Literacy* (Project 2061, American Association for the Advancement of Science, 1993), which includes biological and cosmological evolutionary concepts. Once Staver's committee began meeting with the school board in January, the discussion focused almost exclusively on if and how evolution should be included in the standards.

One member of the board, Steve Abrams, a conservative and a former state Republican chairman, said he had "some serious questions" about the proposed new standards and claimed "it is not good science to teach evolution as fact." He and other creationists rewrote the standards, deleting most of the two pages on evolution. He also tried to insert the sentence: "The design and complexity of the design of the cosmos requires an intelligent designer." That sentence was stricken after protests by scientists.

After months of deadlock, the board approved the rewritten standards by a vote of 6 to 4.

Kansas Governor Bill Graves strongly criticized the action. He called it "a terrible, tragic, embarrassing solution to a problem that didn't exist. . . . I think this decision is so out of sync with reality that in some ways it minimizes, sort of, the credibility and the oversight that the state board is supposed to have on schools." He said the state board won't be able to stop the teaching of evolution. "What are they going to do, hire the evolution police?" he said.

Bill Wagnon, a board member who opposed the new standards, said they could make Kansas science students "the laughingstock of the world."

The Kansas Education Commissioner, Andy Tompkins, insisted the standards won't remove evolution from Kansas classrooms.

But such decisions have a way of intimidating teachers from forthrightly addressing evolution—indeed that is the whole point of the creationists' political efforts with school boards. Evolution will now not be included in the state assessment tests that students in Kansas take, which lessens any motivation for teachers to spend time on the subject in class.

—*Kendrick Frazier*

*Kendrick Frazier is Editor of the* SKEPTICAL INQUIRER. □

# New Analyses Raise Doubts About Replicability of ESP Findings

SCOTT O. LILIENFELD

The 150-year history of research on extrasensory perception (ESP) has been plagued by what might be termed a consistent inconsistency. As University of Oregon psychologist Ray Hyman points out, this body of literature has followed an all-too-familiar pattern. Seemingly promising and potentially exciting effects using a novel experimental paradigm are reported, only to fizzle out upon closer scrutiny. Each round of replication failures engenders a brief period of disillusionment and disenchantment, which sets the stage for concerted attempts to find a new and improved paradigm.

Eventually, positive findings using yet another novel paradigm are reported, followed by another round of replication failures, and so on. Moreover, in contrast to the argot of what Imre Lakatos termed "progressive" scientific research programs, the lexicon of parapsychology is replete with terms describing the *absence* of effects. The "experimenter (shyness) effect" refers to the failure to obtain positive findings when skeptical researchers are present, the "decline effect" refers to the disappearance or marked diminution of ESP effects within a session following an initial run of positive results, and "psi missing" refers to ESP performance that is significantly worse than chance (see Gilovich, T., 1991, *How We Know What Isn't So*, New York: Free Press, for a good discussion). These terms underscore the absence of a crucial feature that is a hallmark of mature laboratory sciences, namely a readily transportable "experimental recipe" that can yield replicable results across independent laboratories.

This pessimistic state of affairs appeared to change, however, in 1994, when Cornell University psychologist Daryl Bem, in conjunction with the late University of Edinburgh parapsychologist Charles Honorton, published a remarkable article in *Psychological Bulletin*, one of psychology's two most prestigious review journals. Bem and Honorton reported on a series of eleven studies using the "Ganzfeld" (a German word meaning "whole field") paradigm, a method that originated in the 1930s. Subjects ("percipients") in a Ganzfeld experiment are immersed in a uniform sensory field, typically by covering their eyes with Ping-Pong ball halves, directing a red floodlight toward their eyes, and pumping white noise into their ears through headphones. Another individual (the "sender") located in an acoustically shielded room attempts to transmit a specific visual stimulus to the percipient, who then is asked to report all mental imagery that comes to mind. Finally, the percipient is presented with a set of several (typically four) visual stimuli, only one of which is the stimulus viewed by the sender, and asked to rate the extent to which each stimulus matches the mental imagery experienced during the session.

The logic of the Ganzfeld technique relies on the concept of the signal-to-noise ratio. The mental information ostensibly detected by ESP percipients is posited to be an extremely weak signal that is typically obscured by a large number of extraneous stimuli. By placing the percipient in a uniform sensory field, the Ganzfeld technique is hypothesized to decrease the proportion of noise relative to signal and thereby permit investigators to uncover normally weak ESP effects.

With the aid of a statistical technique termed meta-analysis, which permits researchers to quantitatively pool results across a number of studies, Bem and Honorton reported what appeared to be strong, if not convincing, evidence for ESP. The subjects in their meta-analysis obtained overall target "hit" rates of approximately 35 percent, where chance performance would be only 25 percent. Moreover, Bem and Honorton reported several psychologically meaningful predictors of Ganzfeld performance. Subjects who 1) were artistically creative (music, drama, and dance students

*Continued on page 12*

*Scott O. Lilienfeld is an assistant professor of psychology at Emory University and a* SKEPTICAL INQUIRER *consulting editor.*

# Fund for the Future

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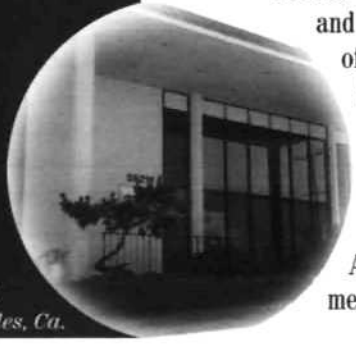

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*Co-chairs of the Fund for the Future Campaign: above, author and TV personality Steve Allen; below, author and critic Martin Gardner.*

## Council for Media Integrity

Formed just weeks after its inclusion in the Ten-Year Plan, the Council for Media Integrity monitors and challenges media programs that convey unfounded claims and mislead the public about science. Members include Steve Allen (co-chair), E. O. Wilson, Stephen Jay Gould, and many others. CSICOP will invest in electronic infrastructure to facilitate rapid response to irresponsible programs.

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## Focusing Upon the Young

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recruited from the Julliard School), 2) extroverted, 3) had previous ESP-like experiences (but who were "novices," i.e., had no previous experience as Ganzfeld subjects), 4) had previously studied a mental discipline, such as meditation (but who similarly were novices), and 5) received high scores on self-report indices of emotionality and perceptual orientation to the environment obtained especially high hit rates. In addition, experimental conditions using dynamic visual stimuli yielded higher hit rates than those using static visual stimuli.

Bem and Honorton's findings, which were widely disseminated in both the popular and academic press, have stirred fresh hopes in the parapsychology community that a truly replicable method of eliciting ESP effects may at last be at hand. Moreover, they have been cited in several popular books, including Dean Radin's *The Conscious Universe*, and Courtney Brown's *Cosmic Voyage*, as providing very promising, if not conclusive, support for the existence of ESP.

Although some critics, like Ray Hyman, found statistical anomalies in the Bem and Honorton data set suggesting the possible existence of subtle but damaging experimental artifacts (see Hyman, R., SKEPTICAL INQUIRER, March/April 1996; and Hyman, R., *Psychological Bulletin*, 1994), Bem and Honorton's meta-analysis was regarded by many as offering the most compelling laboratory evidence to date for the existence of ESP.

This is essentially where things stood until a few months ago, when Julie Milton of the University of Edinburgh and Richard Wiseman of the University of Hertfordshire published an updated meta-analysis of thirty recent Ganzfeld studies not reviewed by Bem and Honorton. Milton and Wiseman's findings, which were published recently ("Does Psi Exist? Lack of Replication of an Anomalous Process at Information Transfer," *Psychological Bulletin* 125(4): 387–391), stand in stark contrast to those of Bem and Honorton and raise serious questions concerning the replicability of the Ganzfeld findings. Specifically, Milton and Wiseman reported a mean effect size across all thirty studies of .013, which corresponds to essentially chance performance and can most charitably be described as negligible.

Moreover, Milton and Wiseman failed to replicate Bem and Honorton's findings that a previous history of ESP-like experiences and the use of dynamic targets predicted enhanced Ganzfeld performance. (Because of insufficient information in the studies, Milton and Wiseman were unable to directly examine Bem and Honorton's other predictors, such as extroversion.) In contrast, Milton and Wiseman did find that previous participation in a mental discipline among novices predicted enhanced Ganzfeld performance. Ironically, however, a re-examination of Bem and Honorton's analyses revealed that this predictor was incorrectly identified as statistically significant in their original article, suggesting that the overall findings for the mental discipline variable in fact amount to another replication failure. In the words of baseball hall-of-famer Yogi Berra, Milton and Wiseman's findings appear to be a case of "déjà vu all over again." Seemingly replicable parapsychological findings have again proven to be disconcertingly elusive, and the experimental ESP literature has again proven to be consistently inconsistent.

Parapsychologists have already begun to raise questions regarding Milton and Wiseman's findings and conclusions. For example, some have criticized Milton and Wiseman for including a heterogeneous set of studies in their meta-analysis, and have pointed out that several studies in their database were in fact statistically significant. Nevertheless, Milton and Wiseman reported that a statistical test of homogeneity conducted on the individual effect sizes suggested that the studies in their meta-analysis can be regarded as being drawn from the same overall "population" of studies.

It seems likely that Milton and Wiseman's meta-analysis will not be the final word on the Ganzfeld technique, and the question of whether this technique will prove to be the replicable paradigm long sought by parapsychologists or merely another tantalizing will-o'-the-wisp is far from conclusively resolved.

It is evident, however, that the ball is now back in the court of parapsychologists, who will need to convince open-minded skeptics that the Ganzfeld technique will not go the way of J. B. Rhine's classic Zener card studies, Targ and Puthoff's remote viewing studies, and other superficially promising but ultimately disappointing ESP paradigms. Otherwise, it may soon be back to the drawing board for yet another paradigm. □


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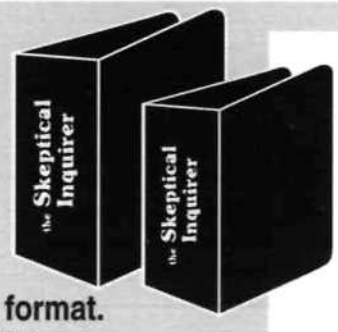


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# The Star of Bethlehem

> Now when Jesus was born in Bethlehem of Judea in the days of Herod the king, behold there came wise men from the east to Jerusalem, Saying, Where is he that is born King of the Jews? for we have seen his star in the east, and are come to worship him. . . . and lo, the star, which they saw in the east, went before them, till it came and stood over where the young child was. When they saw the star, the rejoiced with exceeding great joy.
>
> Matthew 2: 1–2, 9–10

As Christmas approaches, Protestant and Catholic churches will be celebrating the birth of Jesus, with many references in sermons and Sunday schools to the Star of Bethlehem. The nation's some hundred planetariums will be devoting Christmas programs to possible natural causes of the Star. According to the book of Matthew, the only gospel to give an account of the Star, the wise men from the east (their number is not given, but tradition makes it three) were guided westward by the Star to the stable where the newborn Jesus lay in a manger.[1] There was no room at the inn for his parents (perhaps I should say "parent" because the gospels make clear that Joseph was not the baby's father).

Saint Augustine and other early Catholic theologians took for granted that the Star was one of God's miracles, placed in the heavens to lead the wise men to Bethlehem. When Copernicus, Kepler, and Galileo ushered in the rise of empirical science, it became fashionable for Christian scholars to seek natural causes for events which the Bible clearly describes as supernatural.

One of the most popular and longest lasting of natural explanations of the Star was put forth by Kepler. He suggested in a 1606 tract that the Star was actually a conjunction of Jupiter and Saturn that occurred in 7 B.C. in the constellation of Pisces the Fish. He was not the first to suggest this; the conjecture can be found in English church annals as far back as 1285, but Kepler was the first to argue the possibility at length. The constellation's name was a happy coincidence because a fish had long been, as still is today, a symbol of the Christian church and its believers.

Scholars now agree that Jesus was born sometime between 4 and 8 B.C. Matthew dates the birth as in the "days of Herod." Herod is known to have died early in 4 B.C. so Jesus must have been born before then. The exact year is, of course, unknown, though it could well have been at the time of the 7 B.C. Jupiter-Saturn conjunction.

Kepler later had doubts about his conjecture. As astronomer Roy K. Marshall points out in his booklet *The Star of Bethlehem* (published in 1949 by the Morehead Planetarium, at the University of North Carolina, Chapel Hill), Jupiter and Saturn, throughout the period of their proximity, were never closer together than two diameters of the Moon as it appears in the sky. In 1846 British astronomer Charles Pritchard did some careful research on the event. Because of the erratic looping paths of the two planets, as seen from Earth, there were three separate close encounters. Astronomers call it a "triple conjunction."

The two giant planets were closest on May 29, October 1, and December 5. "Even with . . . the strange postulate of someone with weak eyes," Pritchard wrote, "the planets could not have appeared as one star." Marshall adds: "Only an abysmally weak pair of eyes could have ever merged them."

There are other objections to Kepler's guess. A much closer meeting of the same two planets occurred in 66 B.C. As Arthur C. Clarke says in his entertaining essay "The Star of Bethlehem" (Chapter 4 in his collection of essays *Report on Planet Three*, 1972), this event "should have brought a delegation of wise men to Bethlehem sixty years too soon!"

Each of the three conjunctions of 7 B.C. lasted only a few days, whereas Matthew has the Star guiding the wise men throughout a journey that must have taken at least several weeks. Finally,

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*Martin Gardner's latest book is* Visitors from Oz.

the two planets would rise and set like ordinary stars, planets, and the Sun and Moon, but Matthew describes the Star as lingering in the sky as it glided slowly toward Bethlehem. Kepler eventually decided the Star was created by God between Jupiter and Saturn when they were close together.

**Kepler suggested in a 1606 tract that the Star was actually a conjunction of Jupiter and Saturn that occurred in 7 B.C. in the constellation of Pisces the Fish.**

Kepler's original conjecture became popular among nineteenth-century Christians, especially in Germany where the so-called "higher criticism" of the Bible favored natural causes for Biblical miracles. The 7 B.C. theory was also defended in endless popular biographies of Jesus published in Christian countries. In England the Anglican cleric Frederic W. Farrar, in his *Life of Christ (1874)*, devotes several pages to a scholarly discussion of the 7 B.C. conjunction. Samuel J. Andrews, in *The Life of Our Lord Upon the Earth* (1891), an American work, also takes Kepler's theory seriously.

In recent years the 7 B.C. conjecture has been revived in the lengthy life of Jesus section that makes up the final third of the massive *Urantia Book* (1955). This bible of the Urantia movement purports to have been written entirely by supermortals who channeled the text through members of the movement to give to Urantia, the cult's name for Earth, a new revelation destined to supersede Christianity. On page 1352 of the *Urantia Book* we learn that the Jupiter-Saturn encounter of May 29, 7 B.C., gave the appearance of a single star, which we know it didn't, and this accounts for what the supermortals call the "beautiful legend" that grew up about the "Star." The supermortals, or "unseen friends" as Urantians like to call them, reveal that Jesus was born at noon, August 21, 7 B.C. It is a date celebrated annually by Urantians. (For more on the bizarre Urantia movement see my book *Urantia: The Great Cult Mystery*, recently reprinted in paperback by Prometheus Books.)

Other planetary conjunctions in later years have been considered as possible explanations of the Star. For example, a spectacular merging of Jupiter and Venus took place on June 17, 2 B.C. The disks of the two planets actually overlapped! This candidate for the Star is defended by James De Young and James Hilton in "Star of Bethlehem" *(Sky and Telescope*, April 1973), and again by Roger Sinnott in "Computing the Star of Bethlehem" (*Sky and Telescope*, December 1986). Jupiter and Venus were last that close in 1818, and won't be again until 2065.

Still another contender for the Star is a supernoval explosion that occurred in the spring of 5 B.C. in the constellation of Capricorn. You'll find this argued by British astronomer David H. Clark and two associates in *The Quarterly Journal of the Royal Astronomical Society* (December 1977). Other speculations, too absurd to consider, have hung the Star on Venus, comets, exploding meteors, and even ball lightning.

Immanuel Velikovsky, an orthodox Jew, struggled to invent natural causes for Old Testament miracles. He was not, of course, interested in doing the same thing for the New Testament miracles. He even proposed a natural explanation of how Joshua made the Sun and Moon stop moving: It was really Earth that ceased rotating. This was caused by a mammoth comet that erupted from Jupiter, and passed close to Earth before it settled down to become Venus! Some of today's far-out New Agers who

Gustave Doré

The wise men guided by the Star of Bethlehem.

believe in the reality of PK (psychokinesis) regard Jesus as a great psychic who used natural psi powers to walk on water, multiply loaves and fish, turn water into wine, and perform other stupendous feats of magic.

Ellen Gould White, prophetess and one of the founders of Seventh-day Adventism, had a much simpler, and more sensible, approach to the Bible's great miracles. She took them to be miracles. In *The Desire of Ages*, her book on the life of Jesus, she explains the Star as follows:

> The wise men had seen a mysterious light in the heavens upon that night when the glory of God flooded the hills of Bethlehem. As the light faded, a luminous star appeared, and lingered in the sky. It was not a fixed star nor a planet. . . . That star was a distant company of shining angels. . . .

The association of the Star with angels goes back to the early Church fathers. Longfellow, in the third section of his miracle-play "The Nativity" (it is part of his book *Christus: A Mystery*), toys with the notion that the Star was held in the sky by angels. There were seven: angels of the Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn. Here is Longfellow's opening stanza:

> The Angels of the Planets Seven,
> Across the shining fields of heaven
> The natal star we bring!
> Dropping our sevenfold virtues down
> As priceless jewels in the crown
> Of Christ, our new-born King.

What is my opinion about all this? I find it hard to comprehend why conservative and fundamentalist Christians, who believe the Bible's miracles to be actual events, would even try to find natural explanations for what the Bible clearly describes as divine supernatural phenomena. The Jehovah of the Scriptures has awesome powers to suspend natural laws and do whatever He wants. Why trouble to look for natural causes of the great downpour by which God drowned every man, woman, and child on Earth, as well as their pets, except for one undistinguished family and the few animals they took on their Ark? I once asked a Seventh-day Adventist why God would be so cruel as to murder all the innocent little babies. He replied that God foresaw how wicked they would become if allowed to grow up!

In my not-so-humble opinion, the story of the Star is pure myth, similar to many ancient legends about the miraculous appearance of a star to herald a great event, such as the birth of Caesar, Pythagoras, Krishna (the Hindu savior), and other famous persons and deities. Aeneas is said to have been guided by a star as he traveled westward from Troy to the spot where he founded Rome. (I was unable to find a reference to this in Virgil's *Aenead*, and would be grateful to any reader who can locate the reference for me.) The legend about the Star of Bethlehem is believed by many scholars to have arisen to fulfill a prophecy in Numbers 24:17, "I shall see him [God], but not now. I shall behold him, but not nigh: there shall come a star out of Jacob, and a Sceptre shall rise out of Israel."

**I find it hard to comprehend why fundamentalist Christians, who believe the Bible's miracles to be actual events, would even try to find natural explanations for what the Bible clearly describes as divine supernatural phenomena.**

Although I do not think the Star of Bethlehem ever existed, or was an illusion caused by a natural astronomical event, I find Mrs. White's statement more to be admired than the futile efforts of liberal Christians to banish from the Bible all references to God's miraculous powers. I find this almost as degrading of the Bible as the efforts of ultra-feminist Christian leaders to expunge from Scripture every sentence in which God is called "Father" (or given any other masculine term), and Jesus is called "Son." The practice strikes me as even more ridiculous than trying to change "nigger," in such classic novels as *Huckleberry Finn*, and Joseph Conrad's *Nigger of the Narcissus*, to "African American."

Let the Bible be the Bible! It's not about science. It's not accurate history. It is a grab bag of religious fantasies written by many authors. Some of its myths, like the Star of Bethlehem, are very beautiful. Others are dull and ugly. Some express lofty ideals, such as the parables of Jesus. Others are morally disgusting. I think of the tragic legend about the rash vow of Jephtha that prompted him to sacrifice his daughter. (Why does St. Paul speak of Jephtha as a man of great faith?) Or the account of how an angry Jehovah slew Moses' two nephews with lightning bolts merely because they failed to mix the incense properly for a sacrifice. God didn't like the way the smoke smelled! The Old Testament's God is as skillful as Zeus at using lightning as a weapon of punishment.

The King James Bible is itself a near-miracle, its poetic style far more beautiful and moving than any modern translation in English or any other language. It is also an improvement over the frequently crude writing by the old Hebrew and Greek authors. The King James Bible is a literary masterpiece best left unaltered. It is a classic to put on a shelf alongside the great fantasies of Homer, Virgil, Dante, Milton, and yes, even the Koran.

## Note

1. Matthew's account of the visiting magi is retold in greater detail in the apocryphal Book of James, a Greek manuscript of the second century. Legend has it that it was written by a half brother of Jesus. According to Origen, he was one of Joseph's sons by a former marriage. Chapter 15, verse 7, describes the Star as so huge and bright that it rendered all the other stars invisible. □

**INVESTIGATIVE FILES**

JOE NICKELL

# Curses: Foiled Again

The tragic death of John F. Kennedy, Jr., on July 16, 1999, sparked renewed claims of a "Kennedy curse"—only the latest in a series of alleged popular hexes such as the Hope Diamond jinx and the curse of King Tut's mummy.

During live CBS coverage of the search for Kennedy's missing airplane, Dan Rather (1999) referred to "the alleged Kennedy curse," while after the bodies of Kennedy and his wife and sister-in-law were recovered, *U.S. News & World Report* (July 26, 1999) ran a front-cover story unequivocally titled "The Kennedy Curse." A *Buffalo News* headline spoke more factually of a "litany of Kennedy tragedies" (Anthony 1999), a list that varies from source to source but generally includes the following misfortunes in the family of Joseph and Rose Fitzgerald Kennedy:

1941: Daughter, Rosemary, is institutionalized due to retardation and the effects of an unsuccessful lobotomy.

1944: Son, Joseph, Jr., dies in airplane explosion in World War II.

1948: Daughter, Kathleen, dies in plane crash in France.

1963 (August 9): Grandchild, Patrick (son of President John F. and Jacqueline Kennedy), dies after premature birth.

1963 (November 22): Son, President John F., is assassinated.

1964: Son, Edward, is injured in plane crash that kills an aide.

1968: Son, Robert F., is assassinated while campaigning for Democratic presidential nomination.

1969: Son, Edward, narrowly escapes death when car plunges off bridge on Chappaquiddick Island, killing a passenger.

1973: Grandson, Joe (son of Robert and Ethel), overturns a Jeep, paralyzing a passenger.

1973: Grandson, Edward M. Kennedy, Jr., has leg amputated due to cancer.

1984: Grandson, David (son of Robert and Ethel), dies of drug overdose.

1991: Grandson, William Kennedy Smith (son of Jean Ann Kennedy), is charged with rape but acquitted in trial.

1994: Daughter-in-law, Jacqueline, dies of cancer.

1997: Grandson, Michael (son of Robert and Ethel), is killed in "ski football" accident.

And this is only a partial list. Senator Edward Kennedy's son Patrick sought treatment for drug addiction in 1985 and Michael Kennedy, before his fatal accident, was disgraced due to an alleged affair with a 14-year-old baby sitter (Davis 1984; Thomas 1998; Anthony 1999; Salkin 1999; Kelly and Walsh 1999).

Certainly the list is as long as it is filled with tragedy. But is it evidence of a curse? What exactly is meant by the term?

Actually a "curse"—also known as a "hex" or "jinx"—is an alleged paranormal assault that can supposedly result in physical or mental injury or illness—even death. Known to New Age mystics as a "psychic attack" (Guiley 1991), a curse is an ancient concept said to have either human direction (as from a sorcerer) or a supernatural one (such as by angry gods, demonic spirits, or the like). As an example of the first, in the Old Testament when Noah became displeased by his son Ham, he placed a curse on him (Genesis 9: 21–27); and, as a supernatural example, Jehovah dealt with an intransigent pharaoh by visiting upon him ten plagues (Exodus 7–12).

Various occurrences could spark belief in the existence of psychic attacks. For example, although the plagues on pharaoh are not mentioned in any source other than the Bible (Asimov 1968), and some see the account as pure allegory (Graham 1979), such phenomena can occur naturally. (Proliferations of locusts and frogs, for instance, are not unknown, and the water turning to "blood" could be equated with a "red Nile" wherein flood waters are colored by lake deposits [Keller 1995; Acquistapace 1991].)

A phenomenon that can actually simulate a psychic attack is the "hag syndrome." Typically the "victim" awakens to feel a weight pressing on the chest and to see bizarre imagery (e.g. an "old

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hag," incubus, vampire, or the like). Known from ancient times, and estimated to occur presently in some fifteen percent of the world's adult population (Guiley 1991), the syndrome is popularly termed a "waking dream" and occurs in the twilight between being asleep and awake (Nickell 1995). Because such an experience may seem quite real to the "victim," it could appear to prove to that person that he or she was actually accursed.

Apart from such dramatic "evidence," however, essentially belief in curses is simply a superstition—that is, "a belief that some action not logically related to a course of events influences its outcome" or "any belief, practice, or rite unreasoningly upheld by faith in magic, chance or dogma" (*American Heritage* 1981). As with other superstitions (such as the fear of Friday the thirteenth), once the idea of a curse is planted, it can take root in the imagination so that any harmful occurrence is counted as evidence for the jinx, while beneficial events are ignored. In this way superstitious or magical thinking tends to start with an answer and work backward to the evidence, in contrast to scientific or rational thinking that allows evidence to lead to an answer.[1]

This process of focusing only on negative evidence clearly perpetuates many popular "curses," including alleged "Jinxed Seas" like the so-called "Devil's Triangle" of the Atlantic where ships and planes supposedly vanish without a trace. In fact, however, as Lawrence David Kusche demonstrated in his investigative classic, *The Bermuda Triangle Mystery Solved* (1975), the disappearances are actually tragedies involving a combination of bad weather, heavy sea and air traffic, equipment failure, human error, and journalistic exaggeration and misattribution. (Many incidents attributed to the zone in fact occurred elsewhere.)

Another such example is the site near Niagara Falls known as "Devil's Hole" that is allegedly "cursed with an aura of sheer bad luck." Indeed, asserts one writer,

> Those ghost hunters who wish to explore Devil's Hole must do so at tremendous personal risk. Only those blessed with extremely good luck or who feel that they have nothing left to lose should even attempt to study this site. The forces at work in this area are so strong and unpredictable that even experienced ghost hunters with extraordinary climbing, survival, and caving skills are likely to fall victim to the cave's intense aura (Blackman 1998).

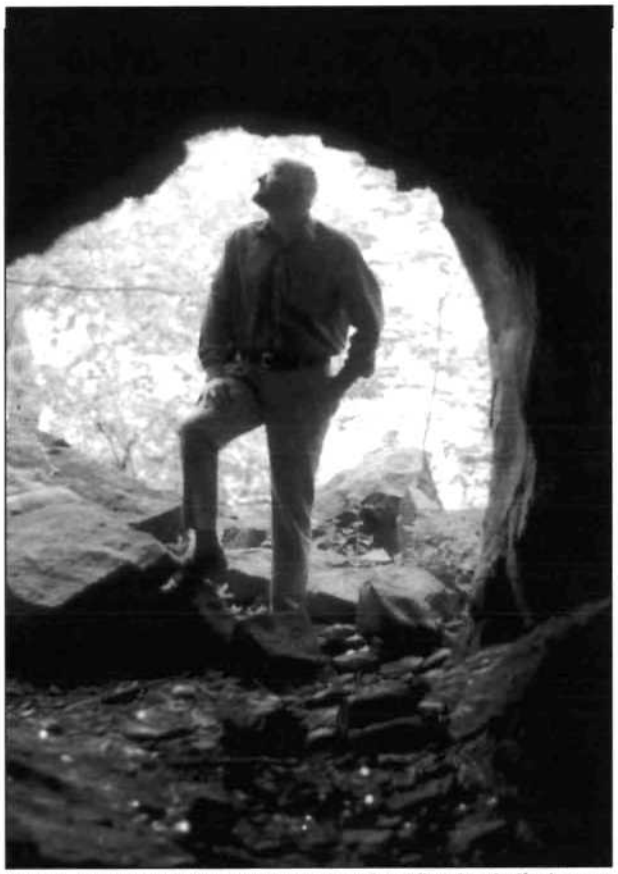

*Figure 1. Cursed cave? SKEPTICAL INQUIRER Managing Editor Ben Radford tempts gloomy Devil's Hole near Niagara Falls. (Photo by Joe Nickell)*

Actually, SKEPTICAL INQUIRER managing editor Ben Radford and I challenged Devil's Hole on May 20, 1999 (see figure 1) and lived to tell about it. (In fact, park official Barry Virgilio told us there was not a high incidence of injury in the area despite heavy pedestrian traffic, and that accidents were typically due to risky behavior.)

Other examples of "curses" involving a selective focus include those attributed to King Tut's tomb and the infamous Hope Diamond. After the discovery of Tutankhamen's lost burial chamber in 1922, expedition financier Lord Carnarvon died of blood poisoning from an infected insect bite, and in 1926 his former nurse died in childbirth. The archaeologist who discovered the tomb, Howard Carter, lost two assistants to what newspapers began to call "King Tut's Curse." They reported that there was an inscription over the tomb's entrance that read, "Death shall come to him who touches the tomb." Over the years some archaeologists and tourists became ill or even died after they visited the site. Some have suggested that a mysterious bacterium or fungus in the tomb causes people to become ill.

In fact, there was no curse inscription on or in the tomb. In 1980 the site's former security officer admitted the story of the curse had been circulated in order to frighten away would-be grave robbers. As to the misfortunes, there was no pattern to them, the "victims" dying of a variety of causes. Some may have been ill anyway, and the added effects of travel, climate, and other stressful factors may have contributed to any illness-related deaths. In fact, balancing the list of misfortunes is the fact that ten years after the pharaoh's tomb was opened all but one of the five who first entered it were still living. Carter himself lived on until 1939, dying at the age of sixty-six. Lord Carnarvon's daughter and others associated with the tomb, including the photographer and Egypt's Chief Inspector of Antiquities, lived normal life spans. And Dr. Douglas Derry—the man who actually dissected the mummy of Tutankhamen—lived to be over eighty years old (Nickell 1989).

But has the Hope Diamond—a.k.a. the "Diamond of Doom"—indeed "left a trail of death, debt, and disaster among its owners" ("Diamond" 1976)? The seventeenth-century French trader

Jean Baptist Tavernier, who first acquired and sold the magnificent blue gem to Louis XIV for a king's ransom, later suffered financial ruin. Louis XVI, who cut the diamond into the shape of a heart, gave it to his queen, Marie Antoinette, before both were taken to the guillotine by French revolutionaries. Stolen by thieves, the gem—or rather a portion of it, cut to its present oval shape—surfaced in London where it was bought in 1830 by a rich banker named Henry Thomas Hope.

The faceted stone then passed through a succession of owners who reportedly suffered such misfortunes as bankruptcy, suicide, and even murder. In the obituary for one alleged victim who died in 1947, a United Press story declared, "The Hope diamond has a long reputation as a 'jinxed' stone whose ownership carries with it a cloud of tragedy" (MacDougall 1983).

As with "King Tut's curse," however, support for the "Hope diamond jinx" is built on selective evidence. According to Curtis D. MacDougall in his *Superstition and the Press* (1983), "Study of the complete history of the fabulous jewel reveals that at least half of those who owned or used it seemingly were not affected by any curse. How unusual is it for about half the members of any family to experience bad luck?" Moreover, he says, since acquiring the stone in 1958, ". . . the Smithsonian Institution has not suffered from fire, theft, or death as a result of its famous possession. Because of the prominence of many of the diamond's owners the press has kept alive the myth of a curse, translating every untoward occurrence to fit the pattern" (see figure 2).

Interestingly, once the selective process changes focus—as happened with the quartz effigy known as the "Crystal Skull"—so do the imagined consequences. Once said to have the power to cause death (Mitchell-Hedges 1954), a claim utterly lacking support (Nickell 1988), the erstwhile "Skull of Doom" has become a talisman to New Agers who now "channel" hopeful messages from it and credit it with wonderful psychic "energies," even placing their own crystals next to it to supposedly "charge" them (Bryant and Galde 1991).

A similar process of selection and hype helps promote "the Kennedy curse." In 1984 *Newsweek* continued a long journalistic tradition of describing the family as a "star-crossed dynasty" (Beck et al. 1984) and later headlined a report on Michael Kennedy's accidental death "The Camelot Curse" (Thomas 1998). In reporting on the John F. Kennedy, Jr., tragedy, one wire service story proclaimed that "The legendary Kennedy family curse had struck again" (quoted in "Irresponsible" 1999).

Figure 2. Jinxed jewel? Once allegedly doom-laden, the Hope Diamond now reposes serenely in the Smithsonian. (Photo by Joe Nickell)

Actually, the Kennedys themselves have helped foment the myth. For example, in his television address to the people of Massachusetts in the wake of the Chappaquiddick tragedy, Ted Kennedy (1960) admitted that among his "irrational" thoughts of the period had been the question of "whether some awful curse did actually hang over all the Kennedys." And Michael Kennedy had said of Robert Kennedy's assassination, "It was as if fate had turned against us. There was now a pattern that could not be ignored" (Kelly and Walsh 1999).

Despite the hype, there has also been much appropriate skepticism. A German daily editorialized: "A plane crash is a dreadful, horrible banality. But when a member of the Kennedy dynasty crashes a plane, the accident becomes a sign of inescapable destiny . . . and the global infotainment industry has its raw material—the curse of the Kennedys" (quoted in "Curse or hubris" 1999). Commendably, the Wichita Falls, Texas, *Times Record News* had this to say:

> The notion that a family is cursed harkens back to the Dark Ages or the early days in this country when women were burned at the stake because they were believed to be witches and men were drawn and quartered because they were believed to be inhabited by evil spirits. Yet, even if educated reporters and editors don't actually believe in the fact that a family or an individual can be cursed, we see that idea promoted to a public that borders on scientific illiteracy already and, as proven by the popularity of all sorts of magical, mystical cures for ailments, the popularity of horoscopes and psychic readings, that is pretty darn gullible.

The editorial went on to indicate various factors that were actually responsible for the alleged curse and concluded that, for the notion to be entertained, "there needs to be proof that's more reputable than the zero proof offered right now. Extraordinary claims require extraordinary proof" ("Irresponsible" 1999).

The *Times Record News* editorial writers joined other skeptics in pointing out the real factors that can lead to the perception of a curse. Tacitly acknowledging selectivity, *U.S. News* conceded that the Kennedy family was "blessed and cursed all at once" (Kelly and Walsh 1999). And former JFK special counsel Ted Sorensen (1999), wrote: "The Kennedys are not accursed but blessed. True, they have endured, with remarkable religious faith, more than their proportionate 'share' of pain (though that is never allotted by the law of averages anyway). But they have also been endowed with good genes, good brains, good looks, good health, and good fortune, with both instincts and opportunities for serving their country and helping those less fortunate."

In addition to the selective process, there is the sheer size of the Kennedy

family. With nine children producing twenty-nine grandchildren, there have been increased opportunities for tragedy. Observes Temple University mathematics professor John Allen Paulos (1999), "If we look at large families we can sometimes find more death, disease, and tragedy than is generally expected."

Still another factor is the common tendency to connect the unconnected. Much like the impulse that prompts us to see pictures in clouds or other random forms, there is the impetus to find dubious relationships between events—a sort of connect-the-dots tendency that the *Times Record News* observed "seems to be one characteristic of human nature." Asks the editorial, "When traffic accidents cluster around one intersection, would we blame our luck on the curse of the car gods or would we recognize that congestion or some other factor might play the major role in the number of accidents occurring there?" ("Irresponsible" 1999).

The *News* joined others in pointing out the evident Kennedy "propensity for risk-taking" (Paulos 1999). Although Sorensen (1999) insists the family is characterized by an adventurous rather than foolhardy spirit, the line between the two often blurs. Michael Kennedy died as a result of the risky family pastime of "ski football"—a game the Aspen, Colorado, ski patrol had warned against (Thomas 1998, 23). And a friend of JFK Jr. stated that the son of the thirty-fifth president "loved to dance on the edge" (Barlow 1999), a tendency that may have been involved in his chancing a nighttime flight. Apart from mere adventurousness, simply seeking political office obviously brings increased risk of assassination—a factor that belies the notion of a curse in the deaths of President Kennedy and his brother, presidential candidate Robert F. Kennedy.

And speaking of assassination there is another factor that aids the perception of a curse: visibility. Paulos (1999) notes that "When a celebrity's private life and death become public, news gets disseminated so rapidly and so thoroughly that we're blinded to everyone else's lives"—as happened with JFK's assassination. Also, the Kennedy family's involvement in various aspects of American society—an involvement that increases the family members' visibility—can help foster "the perception of more misfortunes" (Paulos 1999).

Especially when taken together, these factors may help promote superstitious belief in a Kennedy curse, although it is never stated who or what has cursed the family or why. But as presidential historian Doris Kearns Goodwin (1999) said of the cumulative tragedies, the Kennedys' willingness to carry on demonstrated "a love of life that's just the opposite of giving in to a curse." And conservative columnist William Safire concluded (1999): "There is no curse that hangs over anybody. It's against our idea of free will, whether you buy the Hope diamond or enter King Tut's tomb."

**"The Kennedys are not accursed but blessed. True, they have endured, with remarkable religious faith, more than their proportionate 'share' of pain.... But they have also been endowed with good genes, good brains, good looks, good health, and good fortune."**

## Note

1. This contrast in approaches is illustrated with regard to the Shroud of Turin in my column "Science vs. 'Shroud Science,'" SKEPTICAL INQUIRER 22(4), July/August 1998: 20–22.

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# Looking for Mr. Goodape

Over a period of more than twenty years, veteran Bigfoot chaser Erik Beckjord of the Sasquatch Research Project has camped with other researchers at a remote spot in California's Sierra Nevada mountains between Yosemite National Park and Lake Tahoe, at an altitude of 6,400 feet. He describes it as a "window site" where, he says, evidence of Bigfoot is almost routinely seen. "At this site we have obtained photos of weird aliens, bigfoot, gargoyles, etc. that we never saw when we clicked the camera. We hear bigfoot-steps. FIND BF tracks. Hear roars, wails, screams, some as close as fifty ft. Hear heavy breathing outside tents. Have strange shape-shifting 'humans' come by camp," he claims on his Web site at http://www.beckjord.com/bigfoot.

If this doesn't sound like the kind of encounter you'd expect to occur in Bigfoot country, it is because Beckjord, unlike many Bigfoot researchers, maintains that "Bigfoot is not as simple as you think it is. Yes, it looks like an erect ape. It smells, sometimes, and it leaves tracks—sometimes. But it never dies. . . . Bigfoot then, seems to be an alien shape-shifting being that may possibly be able to slip into alternate dimensions or worlds. We think."

*Robert Sheaffer's World Wide Web page for UFOs and other skeptical subjects is at www.debunker.com.*

Beckjord, who operated the short-lived UFO Museum in San Francisco (see http://www.cnn.com/US/9704/19/ufo.museum/index.html), has been proclaiming for years that all skeptics were too timid and closed-minded to actually go out into the woods and confront the Bigfoot evidence for themselves. Because I got tired of hearing this, and because I hadn't been out camping for a while, I agreed to join the search. "Bring your lady friend," Beckjord urged me. "Bigfoot loves women!" Phoebe, unfortunately, was not able to join us, but she was kind enough to loan me her Jeep.

When the time came to depart, Beckjord was hours late for our initial rendezvous. Indeed, all his planning for the big Bigfoot expedition seemed at best haphazard. Driving up to the mountains, we had to make frequent stops for him to purchase items he didn't bother to get in advance. By the time we finally reached the entrance of the Bear River Reservoir area of the El Dorado National Forest, darkness had overtaken us. Beckjord—who claimed to have been to the Bigfoot "window area" so many times he could find it in his sleep—led us around dusty, unpaved Forest Service roads for an hour and a half before reaching a dead-end and admitting that we had made some wrong turns. We camped the first night right where we found ourselves. The sky was clear and dark, the Milky Way spectacular. We saw a brilliant reflection from an Iridium satellite that looked as bright as a magnesium flare, appearing much more spectacular than any I'd seen before because of the very dark skies. Beckjord says that he had observed an event like this while researching crop circles in England in 1997 but considered it a UFO. Before we retired, he loudly played a tape of a human infant crying (which sounds eerie in the wilderness!), claiming that is sometimes successful in attracting Bigfoot. He then set up two "Bigfoot detectors," infrared sensors that beep if the signature of a person or a large animal is seen. The detectors were silent until he went out to turn them off the next morning.

With the help of daylight, we easily located Bigfoot's paranormal "window site" (Beckjord doesn't want me to disclose the exact location, lest "evil people" go there and cause unspecified harm). Finding the road leading into the site in even worse shape this year than before, we saw that it would obviously be accessible only by four-wheel drive vehicles, which seemed to rule out taking in Beckjord's 1978 Ford station wagon. While we were studying the obstacles between our vehicles and the site, we met a friendly fellow with a four-wheel drive truck, who offered to carry Beckjord's equipment past the impassable stretch of road. Afterward, Beckjord speculated in his e-mail Bigfoot newsletter that perhaps the helpful stranger was not at all what he appeared to be: "Sort

of a Good Samaritan MIB but in jeans. Now, was he CIA, MIB, MIJeans, a shapeshifter, or a *tulpa*, complete with truck?" Apparently, these days shapeshifters have the capability to take on not only animate forms, but become motor vehicles as well.

We set up camp right at the shore of Bigfoot's pond, bypassing a more comfortable camping site a hundred yards away at the other pond because Bigfoot allegedly doesn't show up at that one. Unfortunately, Bigfoot seems to have chosen to make his home in a low-lying area with nearby brackish water, probably one of the most heavily mosquitoed areas of the forest. This suggests the possibility that Bigfoot, if he exists, may be a lower form of life. We looked all around the site, but didn't see or hear much except flies and mosquitoes. Even animal life is sparse around there because there is so little food in the high-altitude forest. Later, Beckjord decided not to allow the road obstacles to deter him from bringing his old station wagon to the site. He nearly made it over road holes, rocks, and streams until his car was solidly captured by a huge mudhole. I towed it out with the Jeep.

Beckjord had arranged with a group of psychics to help us see Bigfoot by projecting their powers toward us one evening at 9:30 P.M. We were instructed to look for flashes of light on the horizon. The time came and went, but nothing happened.

Much of the supposed "Bigfoot evidence" at this site is photographic in nature. That is, even if you go there and don't see anything, faint images of Bigfoot or other anomalous creatures allegedly turn up in the grain of photos you take. In previous years, a supposed Bigfoot had been glimpsed in photos, preferring to lurk under certain trees. I strolled around the pond to carefully examine the area under the Bigfoot trees. Alas, no evidence of anomalous apes was to be seen. We then climbed to the top of the ridge on the other side, where in previous years footprints and other "evidence" of Bigfoot activity had been seen. Alas, the proof still eluded us.

During the whole four days I spent in the Bigfoot "window area," nothing out of the ordinary was seen, heard, felt, detected, or smelled. This is not surprising: the presence of skeptics is known to have a serious dampening effect upon manifestations of all things paranormal. Another factor hindering Bigfoot activity was that there were no women in the party, at least during the time I was there. If we saw anything at all even a little bit unusual, it might have been several rocks that, by a stretch of the imagination (a *big* stretch), look like Bigfoot faces or skulls, when the viewing angle and the illumination was just right. Beckjord attributes this to shapeshifting *tulpas* that temporarily inhabit the rocks and alter their appearance in an attempt to communicate; I attribute it to the workings of an overzealous imagination.

Beckjord relates how, years before, he persuaded a camera crew from CBS News to spend two days at the site. Absolutely nothing unusual was heard or seen during this time (the crew dutifully reported the search, nonetheless). But as soon as the crew had departed, "all hell broke loose" and Bigfoot was heard to scream, move about, break branches, etc. Therefore it was not surprising that it was only after I had left that Beckjord obtained what he claims is a photo of Bigfoot (or at least the shadow of one) on one of the Bigfoot trees across the pond. Not that it would have mattered even if I were there, since the "evidence" was not seen until later, when the film was developed. (My photos, on the other hand, show only bushes, trees, rocks, and leaves. Perhaps my imagination is insufficiently developed to discover the paranormal beings hiding within them.)

Beckjord's Web site now announces the return, "flushed with victory," of "The Great Sierra Bigfoot Expedition 1999." It proudly displays the photo of the shape of "Bigfoot" straddling a split tree trunk (see http://www.beckjord.com/bigfoot/sierratrip.html) He also announced the "preliminary finding" that the "half-Bigfoot" allegedly photographed at the site in 1978 (apparently its lower half never materialized) "was found to have been bridging a ten-foot gap between two trees, resting on a dead two-inch branch!" The significance of this finding is not explained.

As for me, I will do my best to contain my disappointment at not seeing anything paranormal. Maybe the best way to do so would be to get a T-shirt made up: *I went on the Great Sierra Bigfoot Expedition of 1999, and all I found were mosquitoes.* □


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# Blooming 'Shroud' Claims

*News of pollen and plant-image findings on the Shroud of Turin are based on earlier, scientifically discredited research.*

JOE NICKELL

New claims that pollen grains and floral images on the Shroud of Turin link it to pre-eighth-century Jerusalem were made August 2, 1999, by researchers at the International Botanical Congress in St. Louis. (Curiously, the paper that sparked the news reports was not part of the regular conference proceedings but was announced at a news conference at the Missouri Botanical Gardens, which is publishing a book by the claims' authors.) In fact, however, although the Congress provided a new opportunity to present pro-shroud assertions to the news media, the claims are based on earlier, scientifically discredited data. Here is a brief review of some of the claims that were reported uncritically by the Associated Press and other media sources.

## Pollen

It was alleged that pollen on the shroud proved it came from Palestine, but the source for the pollen was a freelance criminologist, Max Frei, who once pronounced the forged "Hitler Diaries" genuine. Frei's tape-lifted samples from the shroud were controversial from the outset since similar samples taken by the Shroud of Turin Research Project in 1978 had comparatively few pollens. As it turned out, after Frei's tapes were examined following his death in 1983, they also had very few pollens—although one bore a suspicious cluster on the "lead" (or end), rather than on the portion that had been applied to the shroud. (See SKEPTICAL INQUIRER, Summer 1994, pp. 379–385.)

*Joe Nickell is author of* Inquest on the Shroud of Turin.

*Facial image on Shroud of Turin (as yielded by a photographic negative).*

## Floral Images

Accompanying the unscientific pollen evidence were claims that faint plant images have been "tentatively" identified on the shroud. These follow previous "discoveries" of "Roman coins" over the eyes and even Latin and Greek words, such as "Jesus" and "Nazareth," that some researchers see—Rorschach-like—in the shroud's mottled stains. The floral images were reported by a psychiatrist who has taken up image analysis and made other discredited claims about the shroud image. Even pro-shroud author Ian Wilson, in his 1998 book *The Blood and the Shroud*, felt compelled to state: "While there can be absolutely no doubting the sincerity of those who make these claims, the great danger of such arguments is that researchers may 'see' merely what their minds trick them into thinking is there."

## Blood

The Associated Press reported claims that the shroud bears type AB blood stains. Actually, two tests of dubious scientific merit that purported to prove the "blood" genuine were not supported by batteries of analyses conducted by internationally known forensic serologists. Indeed the stains, which were unnaturally "picturelike" and suspiciously still-red, were conclusively proved to be red ocher and vermilion tempera paint.

## Oviedo Cloth

Uncritical reportage suggested the Shroud of Turin gained credibility by being linked to another notorious cloth, the Sudarium of Oviedo, which some believe was the "napkin" that

covered Jesus' face. Unfortunately like other "relics" of Jesus—some forty shrouds, vials of his blood and tears, and other products of medieval relic-mongering—the Oviedo cloth is of questionable provenance. It has no historical record prior to the eighth century and, in contrast to the shroud, lacks a facial image. The supposed matching of bloodstains on the Turin and Oviedo cloths is but another exercise in wishful thinking. As to the alleged matchup of pollens, once again the evidence comes from the questionable tapes of Max Frei.

### Dating

The assertion that blood and pollen matching prove the Shroud of Turin dates to at least the eighth century is—based on the evidence—absurd. The shroud cloth was radiocarbon dated to circa 1260–1390 by three separate, highly respected laboratories. Claims that the carbon dating could be in error due to "contamination" lack credibility when it is realized that—in order to have altered the date from the first century to the fourteenth—there would have to be twice as much contamination (by weight) as there is cloth. In fact the radiocarbon date is consistent with a fourteenth-century bishop's report to Pope Clement VII that an earlier bishop had discovered the forger and that he had confessed.

**The source for the pollen was a freelance criminologist, Max Frei, who once pronounced the forged "Hitler Diaries" genuine.**

### Conclusion

As in the past, claims that the Turin cloth may be authentic are simply based on "shroud science"—an approach that begins with the desired answer. In contrast, genuine science demonstrates emphatically that the shroud image is the work of a medieval artist and that the cloth never held a body—let alone that of Jesus. □

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# The Universe and Carl Sagan

*Few people ever extolled the wonders of science with more eloquence or were as effective in defending reason and campaigning against pseudoscience as Carl Sagan. A polymath prodigy and visionary interdisciplinary scientist with lifelong passions for planetary astronomy, the origins of life, and seeking extraterrestrial intelligence, Sagan turned his early enthusiasms about UFOs to rigorous but open-minded skepticism. An excerpt from a new biography,* Carl Sagan: A Life.

KEAY DAVIDSON

All his life, Carl Sagan was troubled by grand dichotomies—between reason and irrationalism, between wonder and skepticism. The dichotomies clashed within him. He yearned to believe in marvelous things—in flying saucers, in Martians, in glistening civilizations across the Milky Way. Yet reason usually brought him back to Earth. Usually; not always. A visionary dreams of a better world than this one. He refuses to think that modern society and its trappings—money, marriage, children, a nine-to-five career, and seemingly blind obedience to a waving flag and an inscrutable God—are all that there is. Sagan was blinded, but not by these. He was blinded by the sheer glory of the new cosmos unveiled by science during the

first two decades of his life. This cosmos was an ever-expanding, unbounded wonderland of billions of galaxies. And across the light-years, Sagan dreamed, random molecular jigglings had perhaps spawned creeping, crawling, thinking creatures on alien landscapes bathed in the glow of alien suns.

This vision blinded Sagan, sometimes, to the needs of the people around him. These included friends who worshipped him, although he hurt them; wives who were entranced by his passions, although enraged by his absenteeism and oft illogical "logic"; sons who were enthralled by his example, even as they struggled to escape his shadow; and colleagues who envied and honored him, even while they scorned his wilder notions and mocked his pomposities. Hardly anyone who knew Sagan intimately has an unmixed opinion of him. In the final analysis, *he* was the dichotomy: the prophet and the hardboiled skeptic, the boyish fantasist and the ultra-rigorous analyst, the warm companion and the brusque colleague, the oracle whose smooth exterior concealed inner fissures.

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To Sagan, the rationale for his broader interests was simple: He refused to pigeonhole himself. He apparently sensed that the coming space age would be radically interdisciplinary: astronomers would have to talk to biologists and chemists and geologists and atmospheric physicists and many other experts whom they normally ignored. Hence he trained himself in subjects unrelated to astrophysics—in particular, biology, which was the topic closest to his first love, extraterrestrial life.

Rare is the scientist with world-class understanding of two broad disciplines—say, astronomy and biology. Sagan was one of the rare ones. The Hutchins program [at the University of Chicago] gave him the confidence to straddle disciplines. He traced this confidence to a biology course in which, he recalled, "there were only three topics. The first was enzyme chemistry; the second was diabetes; and the third was the physiological concomitants of the expression of emotions." True, this selection of biological science "was unrepresentative—no Darwin, no genetics!" Yet the class explored those three topics so deeply—"we read diabetes papers published that very year"—that he evidently concluded that he could understand any topic he wished, if he worked hard enough. Millions of readers would later enjoy the results: a hyperpolymath conversant with astrophysics, biology, neuroscience, primate communication, atmospheric physics, geopolitics, nuclear strategy. . . . Sagan was the multidisciplinary scholar par excellence, the "Renaissance man" so uncommon in the age of specialization, of industrialized academia, where the divisions of labor are as real as in Henry Ford's factories.

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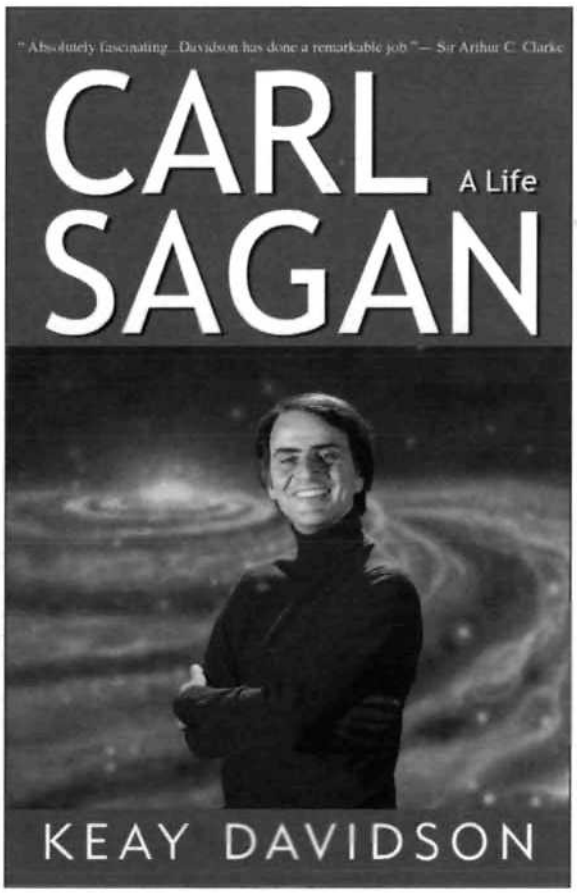
Why did an established scientist like H.J. Muller spend time with this impatient New Jersey teenager who had a short attention span for tedious research and was obsessed with UFOs and aliens? Muller was a generous man. For all the disappointments of his life—betrayed by a political ideology, revolted by Hitlerian perversion of the eugenic ideal—Muller clung to his socialist ethics, which cherished "ordinary" people, however unschooled and immature.

His kindness rubbed off on Sagan. Though later in life, after he had become famous, Sagan struck many colleagues as arrogant, he almost always displayed patience and good humor when addressing laypeople. After Sagan's death, his friend Paul West published a novel, *Life with Swan* (1999), that featured a blatantly Saganish character, one Professor Raoul Bunsen, who, West wrote, was "as willing to answer stupid elementary questions as to formulate, almost as masochistic exercise, questions nobody could answer." A true science popularizer must have a democratic soul; he cannot afford to feel contempt for his audience. Otherwise, why bother popularizing? As Sagan's fame grew, he became accustomed to standing at a podium and listening as an audience member stood and asked him a question about UFOs or astrology or other silliness. Then, typically, Sagan responded firmly but politely, trying to make the questioner feel intelligent, not like an ignoramus. Any other speaker might have snapped, "That's the dumbest thing I ever heard." But Muller wouldn't have said that; nor did Sagan.

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Carl Sagan rejected religion from an early age. In the early twentieth century powerful forces of secularization were sweeping through American Judaism (as through all Western culture). The Holocaust caused some Jews to reject God altogether: what deity would have permitted such a horror?

Sagan celebrated his bar mitzvah at age thirteen. "But in exactly that period when I was sort of seriously reading the Bible," he recalled, "I found all sorts of obvious contradictions with reality. [For example], two different, contradictory accounts of the origin of the world in Genesis. . . . That propelled me away" from religion. Previously, he had soured on Edgar Rice Burroughs's Mars novels because they contained logical inconsistencies. Now he started looking for similar inconsistencies in the ancient texts that had given hope to billions. Were they just old wives' tales? He learned the Bible well. As an adult, debating preachers about religion, Sagan often startled them with his ability to cite passages by chapter and verse.

Sagan's religious doubts upset his mother Rachel. Despite her flinty skepticism about most matters, she trusted in the unseen world. Her faith gave her a sense of stability. Now her only son—her future

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genius!—was rejecting the faith of his fathers? Their religious quarrels, Sagan later admitted, were "traumatic" because for Rachel "there were a lot of emotional, traditional connections" at stake. "There was a time," he recalled, "when my mother and I would have, I guess, 'fights,' on this issue. It only lasted a year." Then Rachel realized it was "hopeless" for her to try to change Sagan's mind, and they stopped fighting.

Sagan's loss of faith intersected neatly with his growing fascination with extraterrestrial life. He had rejected a supernatural explanation of the origin of life (and everything else); therefore he needed to find a scientific one. A great deal was at stake: If life emerged easily by mechanistic means on Earth, then it might be very common in the heavens; if it emerged with difficulty, then very rare. This stirred his interest in the scientific study of the origin of life. Until the early 1950s, such study was almost nonexistent; there had been theoretical papers published here and there, and a book or two, but not much else. While his teenage peers read Mickey Spillane and J.D. Salinger, Sagan turned to physicist Erwin Schrodinger's *What Is Life?* (1946) and chemist A.I. Oparin's *Origin of Life* (written in the 1920s and published in English in 1938).

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In late 1951, when Sagan entered the University of Chicago, another entrant was Stanley Miller, a twenty-one-year-old first-year graduate student fresh from the University of California at Berkeley. That autumn, Miller attended one of Harold Urey's lectures. The chemist explained his theory that early Earth had a hydrogen atmosphere, in which the chemical building blocks of life could have easily formed. Perhaps (Urey noted) lightning bolts provided the energy that caused the early hydrogen-rich molecules, methane and ammonia, to assemble into organics. It'd be interesting, Urey added, if someone would demonstrate this experimentally—that is, by simulating the atmosphere of the primitive Earth in a flask. (Melvin Calvin of Berkeley had tried to, but used the wrong atmosphere, one too rich in carbon dioxide and water vapor.)

Miller was intrigued. He had been looking for a subject for his doctoral thesis, and this one sounded exciting. He approached Urey and asked for permission to do the experiment. Urey reacted cautiously, warning Miller that this was a risky project for a dissertation. But Miller persisted, and Urey finally went along—on one condition. If Miller failed to obtain interesting results within a year, then he had to find a different thesis topic. Miller agreed.

In Miller's experiment, carbon (C) was available from methane ($CH_4$), nitrogen (N) from ammonia ($NH_3$), oxygen (O) from water ($H_2O$), and hydrogen (H) from all three. An electrical discharge would break the molecules apart, possibly causing them to rearrange into organics.

About this time, H.J. Muller had written a letter to Urey, his fellow Nobelist, and urged him to meet Sagan. They did meet, and during their chat Urey mentioned Miller's experiment. Intrigued, Sagan visited Miller in his dungeon-like basement lab. In the "dungeon," Miller filled a flask with methane, ammonia and water. Miller then switched on the "sparking" device and left for the night. The next morning Miller examined the flask: The water within had turned "noticeably pink." Inside were hydrocarbons—chains of carbon and hydrogen atoms. He let the sparking device run for another two days. The result: a scummy layer that, upon analysis, proved to contain an amino acid called glycine. Finally Miller let the experiment spark for a week, after which he found many more types of amino acids, including unknown types. This was a startling result. Previously, skeptics had argued that the building blocks of life could no more self-assemble into complex organics than a windstorm could turn a forest into wooden homes. Yet that is exactly what Miller appeared to have done, in an experiment mimicking presumed conditions on the primordial Earth.

News media jumped on the story. The experiment delighted that tough old Marxist, Haldane, who reportedly said he could "die happy now." Some reporters interpreted the experiment as a latter-day version of the creation of the Frankenstein monster. Of course, Miller hadn't created life—only its molecular building blocks. Still, a 1953 Gallup Poll asked Americans if they thought scientists would eventually create living creatures in the laboratory. Seventy-nine percent replied "No."

Miller described his results in a seminar at the University of Chicago, with Urey present. Sagan sat in the audience. During the question period, Sagan later recalled, other professors didn't seem to appreciate the importance of Miller's experiment, and his results were "roundly condemned by nearly every faculty member that made a comment." As he watched Urey try to defend Miller, and saw how nervous Miller was and how heated the discussion got, Sagan realized for the first time just how emotionally intense research could be.

Miller recalls the scene differently. Now in his late sixties, bustling, bespectacled and ebullient, he remains active in origin-of-life work at the University of California at San Diego. "What Carl didn't realize" Miller says, "was, it wasn't that they didn't *understand* the importance, it's just that they couldn't believe the *results*!" All those amino acids! Thick coats of them! It seemed almost too easy. Almost a century after Pasteur claimed to shut the door for good on mechanistic explanations for life's origin, young Stanley Miller had reopened it.

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Sagan's persistent interest in life's origins was matched only by his persistent interest in UFOs. At least as late as mid-1954, when he was a college junior, he suspected they might be extraterrestrial vehicles, and he tried to persuade Muller of this. The Nobelist countered (perhaps tongue in cheek) by citing one "saucer" report that suggested UFOs were Soviet-built. Sagan replied, in a letter dated January 27, 1954, that there was no reason to believe that all UFOs were of Soviet making. In defense of his position, he pointed out that legitimate sightings had occurred much earlier than when the Soviets came to power. He also argued that the Soviets would not take the risk of flying their saucers over U.S. territory, where many sightings had happened, because if one crashed or was shot down and its origin was discovered, that might start a war. In addition, some of the saucers had been observed making flying maneuvers that would require materials much stronger than anything on Earth and which a human being would not be able to survive.

That letter was Sagan's last known defense of UFOs. Thereafter, his faith was shaken by two books—*Fads and Fallacies in the Name of Science* (1952) by Martin Gardner (another University of Chicago graduate, and later the mathematics editor of *Scientific American*) and *Extraordinary Popular Delusions and the Madness of Crowds* (1841) by Charles Mackay.

*Fads and Fallacies* was a founding tract of the modern "skeptics" movement. Breezily and wittily, Gardner details the pseudoscientific beliefs of anti-Einstein theorists, pyramidologists, medical quacks, psychic researchers, "orgone" therapists, L. Ron Hubbard (founder of Dianetics and its far more profitable descendant, Scientology), and crank cosmologist Immanuel Velikovsky, among others. While enjoying Gardner's account, Sagan was startled to find that it included a devastating chapter on UFOs.

Mackay's book didn't deal with UFOs—it was written a century before the saucer craze. Still, Sagan drew major lessons from Mackay's accounts of the repeated instances in which humans have been gulled by false notions, ranging from get-rich-quick schemes to fortune telling. Gradually, Sagan began to recognize what flying saucers really are: not a physical phenomenon, but a psychological and a sociological one. "It was stunning," Sagan later reflected, "how many pas-

sionately argued and defended claims to knowledge had amounted to nothing. It slowly dawned on me that, human fallibility being what it is, there might be other explanations for flying saucers."

In time, Sagan would become a devastatingly effective critic of the UFO cult—indeed, of the flood of pseudoscience and superstition engulfing America in the second half of the twentieth century.

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At Harvard, Sagan would become a nationally known scientific figure—not famous, exactly, but getting there. With James Pollack, he would study the atmosphere and surface changes of Mars and propose a radical new view of their nature. They would also elaborate and defend Sagan's embattled theory of the Venusian greenhouse effect. In time, these two men—with remarkably similar backgrounds, yet remarkably different personalities—would be one of the great "duos" of modern space science.

Also in the mid-1960s, the mass media began exploiting Sagan. He was not a complete unknown to journalists; his name had appeared in national newspapers and magazines at least as far back as 1956, late in the first term of the Eisenhower Administration. He had even appeared on a television broadcast about Venus, where he impressed viewers with his dualistic lecturing style: darkly serious, contagiously enthusiastic. But his real publicity breakthrough came in 1966, with the publication of his book *Intelligent Life in the Universe* (coauthored with the Russian astronomer I.S. Shklovskii). About this time, Sagan served briefly as an adviser on the film *2001*. Dining with the film's creators, he acquired his first taste of Hollywood.

Carl Sagan and his son Nick. (Courtesy of Nick Sagan)

Simultaneously, he rediscovered an old love: UFOs. In 1965–66, a wave of UFO sightings swept the nation. The resulting media hoopla sparked congressional and scientific investigations. Reporters called Sagan for the scoop on saucers. A Walter Cronkite television special on UFOs included a clip of Sagan, a dulcet-toned oracle of scientific wisdom. He offered journalists an amiably skeptical stance on UFOs—an engaging alternative to the harrumphy finger-wagging of astronomer Donald Menzel, the era's only other well-known saucer skeptic. (By that time J. Allen Hynek had ceased to be very skeptical!)

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When it came to extraterrestrial life, Sagan didn't follow a dogmatic "party line." Sometimes he argued that it was possible (as when he espoused lunar life, balloon animals in the skies of Venus and Jupiter, and polar bear-sized creatures on Mars). Other times he shot down arguments for exobiology (as when he showed that Venus is too hot for life). An example of the latter is his explanation for the Martian "wave of darkening." Until the mid-1960s, many astronomers regarded the wave of darkening as evidence for Martian vegetation change. Yet Sagan and Pollack discovered its true nature, which was *non*biological. It's ironic: Sagan blew away the last indirect evidence for Martian life even as he struggled to convince Americans to support Mars missions. He was a complicated man.

The Sagan-Pollack theory of Mars surface changes should also interest scholars who study how scientific ideas evolve. In recent decades, many historians and philosophers of science have claimed that scientific "objectivity" is a myth. They argue that scientists—like most of us—follow their hearts, not their minds; their desires, not the data. And this is certainly true, much of the time. Still, when it came to the nature of Martian surface change, Sagan followed his *mind*, not his heart.

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During Sagan's first decade at Cornell, he would show up all the snobs and green-eyed detractors at Harvard. He became the preeminent voice of American space science, a national (later international) celebrity visible enough to attract his first *non*scientific critics. Meanwhile, he continued doing science as he liked to do it: by flitting, butterflylike, from flower to flower. Not for him was the life of the pigeon-holed academic who becomes a world-class expert on T-Tauri stars but knows nothing about the Big Bang. Nor for him was the stoic seclusion of the scholar, who takes bitter pride in refusing to popularize his life's toil on the reproductive strategies of carp. Sagan liked talking to reporters. He had liked being on stage, in the spotlight, ever since high school, when he delivered Thurber's bons mots to an audience of proud parents.

True, Sagan worked too hard. He did too much. His scientific accomplishments might have been less arguable had he restricted himself to one or two main fields and diligently plowed them until it was time to abandon all hope and become chair of the department. He bit off more than he could chew—and thus enjoyed one wonderful banquet after another, while his colleagues picked at their beets and parsley. In the process, Sagan befriended many fascinating fellow diners. His scientific lone-wolf days (for example, when he taught himself greenhouse theory) were over. Increasingly, he relied on collaborations, usually transient ones. The results were sometimes scientifically significant, or at least headline-grabbing. They ranged from his work with George Mullen on the role of ammonia in the early atmosphere to his *Astrophysical Journal* article with E. E. Salpeter on the hypothetical "balloon animals" of Jupiter. He maintained close collaborations with a chosen few, particularly Jim Pollack and Bishun Khare. With Pollack, Sagan would erect an impressive edifice of research on the Venusian atmosphere. And with Khare, he would develop an iconoclastic view of cosmic organic chemistry, one centered on inexplicable brownish smears that he dubbed "tholins."

Also in the 1968–78 decade, Sagan cultivated his nonscientific side. He had just married an artist; she helped him tap his inner feelings, instincts, intuitions. Though he felt awkward in social situations at Harvard, his social skills blossomed after he moved to Cornell. Perhaps in this less stuffy setting, he felt free to let his idiosyncratic conversational style out of the box. Eventually, he would become a Noel Coward of science, a man for whom bold articulation and quickness of wit were absolute virtues. His eyes shone as he dominated a conversation, and deservedly so, for he typically knew more about the topic at hand—and discussed it more suavely—than anyone else present. At the same time, he listened as well as he talked. During intense conversation, his dark eyes gazed at you as if you were

the sole other sentience in the cosmos. If you anxiously described the sorry state of your own research, he generously offered tips and suggestions—often crazy ones, but occasionally brilliant ones, too. History does not record how many intellectual Gordian knots were cut by Sagan's razor-sharp tongue at wine and cheese faculty gatherings; there were more than a few. And he remembered what you said with almost photographic precision; months later, he recalled your statements as accurately as if he had tape-recorded them. When he entered a room, the conversational level noticeably improved, as it must have in Oscar Wilde's day when he sauntered into a salon. Through conferences jammed with colleagues Sagan floated, beaming and chatting and joking; he was a six-foot-two gravity well toward whom everyone naturally gravitated. He was fun. "Hey, Carl is here!" It would be an overstatement to say that everyone loved him, for his bluntness upset many and his talent many more; in any case, he rarely failed to cause excitement.

Sagan flexed his new-found artistic muscles in his breakthrough bestseller, *The Cosmic Connection.* He became a TV star, the upbeat educator of sleepy-eyed millions viewing the *Tonight Show.* During the *Viking* mission, he was the TV networks' favorite "talking head," whose playful speculations about an inhabited Mars maddened his colleagues but titillated viewers. And like a performance artist with a NASA-sized budget, he engaged in grand forms of self-expression: he sent "messages" to aliens aboard star-bound space probes, the *Pioneers 10* and *11* and the *Voyagers 1* and *2.*

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Sagan was a contradiction. To critics like Urey, the young astronomer was a reckless speculator. But to laypeople absorbed by pseudosciences and occultism, Sagan was the Dark Prince of skepticism—the party pooper who coldly shot down their ideas about UFOs, psychic phenomena, and other silliness.

By the 1960s, Sagan had long since rejected the thesis that UFOs are extraterrestrial spaceships. Yet he could not quite put the subject out of his mind. Like a disappointed lover, he continued to hang around this subject. He discussed it with reporters, testified about saucers before Congress, served on an Air Force UFO panel, personally investigated lurid UFO reports, and starred in the first scientific "debate" on the subject. Sentimental journeys, all.

Sagan served on an Air Force UFO advisory panel, the O'Brien committee. The committee (named for its chief, scientist Brian O'Brien) evaluated the Air Force's official saucer project, Blue Book. Although depicted in a subsequent TV series as an expensive, computerized outfit, Blue Book was in fact a backwater operation, with a few staffers and filing cabinets crammed into an office at Wright-Patterson Air Force Base. Blue Book was primarily for show. The Air Force had not taken UFOs seriously for years but felt it had to keep up appearances to deal with inquiries from UFO-titillated members of Congress and their constituents. If UFOs represented an unknown physical phenomenon, Blue Book would never figure it out. So Sagan and the rest of the O'Brien committee advised the Air Force to commission an independent, full-scale scientific study. The result was the controversial Condon Commission, chaired by noted physicist E.U. Condon.

Meanwhile, Sagan conducted private investigations of the UFO mania. In 1966, the first UFO "abduction" was described in journalist John G. Fuller's book *The Interrupted Journey.* Fuller (who also wrote about "ghosts" seen on airplanes) said that one night in the early 1960s, when Betty and Barney Hill were driving through New Hampshire, they noticed a distant UFO. The next thing they knew, several hours had passed and they couldn't recall what had happened. They consulted a Boston psychiatrist, Dr. Benjamin Simon. He hypnotized them. Under hypnosis, they claimed that UFOnauts had stopped their car and taken them aboard a saucer, then subjected them to medical examinations.

Sagan spent a "fair amount of time" with the Hills and Simon. The psychiatrist suspected that the Hills' story was an innocent dual hallucination, perhaps related to the stresses of their marriage, which was interracial—an extreme novelty at that time. (Decades later, Sagan was baffled to watch as his Harvard friend Dr. John Mack, a noted psychiatrist and author, became a leading defender of the validity of UFO abduction claims.) In the mid-1960s, at least one respectable American scientist, James McDonald, a professor of atmospheric physics at the University of Arizona, claimed that UFOs were alien spaceships. McDonald met with Sagan and his fellow member of the Order of the Dolphin (a SETI group), MIT physicist Phil Morrison. "I spent many hours with Jim McDonald," Sagan later wrote to UFO investigator Walter N. Webb, adding that he saw no reason to believe that there were any sightings that were credible evidence of extraterrestrial visits.

McDonald's data was "pitiful," Morrison recalls. McDonald showed them "pounds and pounds" of data, including news clippings and tape recordings, about a UFO sighting on Long Island. The witness—a naval architect—drew a sketch of the "saucer." One thing puzzled Sagan and Morrison: the saucer had rivets on its side. "Are we really to believe this?" they asked McDonald. "Look at the rivets that cross the plates here. Do you suppose [aliens] use rivets? Don't you think [the witness] is drawing on his long experience in the Navy yard?" In retrospect, Morrison says of McDonald, "it was distressing that a serious scientist, a good man, would get involved in such research." Like Brian O'Leary, John Lilly, Timothy Leary, J. Allen Hynek and a few other renegade scientists of the 1960s and 1970s, McDonald had heard the siren call of the unknown and would pursue it to the end—in his case, to suicide.

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There are celebrities, and then there are Celebrities. Before the *Tonight Show,* Sagan was slightly known to a small percentage of Americans who had caught his sound bites on TV or read *Intelligent Life in the Universe.* After the *Tonight Show,* he became America's best-known scientist. Sitting in bed at 12:45 A.M., insomniacs watched Sagan with growing excitement. This was no tweedy Mr. Science, filling beakers with smelly chemicals on a black-and-white TV image from the 1950s. Rather, this was a Mr. Science for the hip, disillusioned early 1970s, a boy-man with a startling basso profundo voice, one who kept his cool yet laughed merrily (sometimes at a startling high pitch). Sagan was, simply speaking, sexy, in a sense that transcends mere sexuality.

The young went on alert. Until that moment, the space program offered no convincing heroes for disaffected, anti-establishment, long-haired, pot-smoking college students. To them, astronauts were cornball patriots in crewcuts, blood brothers of the militarists then napalming Vietnam. But Sagan was different: he was youthful-looking (like the class president, but in a fun way). Perhaps he was a secret would-be hipster—the kind of guy who, if handed a joint, might look surprised, then accept it with a laugh and politely try it, coughing afterwards. (In fact, he was secretly an enthusiastic smoker of marijuana.) In college dorms from coast to coast, students (like this writer) didn't stay up until 1:00 A.M. to watch Dinah Shore plug her golf tournament. They stayed up to see Carl Sagan.

On Sagan's first appearance—November 30, 1973—he and Carson discussed what we might want to say to an alien civilization if we ever did contact one, and also the far-out pseudoscientific theories of writer Erich Von Däniken, who had been on the show the previous night. Carson and Sagan were perfect together: Carson bubbled with enthusiastic questions, and Sagan had all the answers.

Over the next thirteen years, Sagan appeared on the Carson show twenty-six times—an average of twice a year. He once explained why

he made every effort to fulfill an invitation to appear on the show—because it gave him the biggest classroom in the country.

* * *

In *Other Worlds,* Sagan lit into pseudoscientists such as Erich Von Däniken, whom he had criticized before, and Immanuel Velikovsky. Von Däniken wanted to rewrite the history of humanity: He claimed that aliens were responsible for the pyramids and other historic artifacts. Velikovsky was even more ambitious: he wanted to rewrite the history of the whole solar system.

In 1950, Velikovsky had published a sensational book, *Worlds in Collision.* It argued that thousands of years ago, Venus was a comet. This comet was somehow ejected from Jupiter, as a tennis ball is shot from an ejector. After its ejection, Venus then barreled around the inner solar system like the ball in a pinball machine. It careened past Earth, triggering apocalyptic events and inspiring scary legends of doom, disaster, locusts, and so forth. While Moses was leading his people out of Egypt, Velikovsky asserted, the comet flew by and exerted mysterious forces on Earth, with the result that the Red Sea parted. Eventually—like teenage hoodlums in the B-movies of that era—Venus calmed down and settled into its present middle-class, predictable orbit.

Sagan and Immanuel Velikovsky debating in San Francisco, April 1974. (Courtesy of Dale P. Cruikshank)

Velikovsky based his hypothesis on ancient manuscripts and legends that, he said, recorded these apocalyptic events. He claimed that very old astronomical records did not mention the planet Venus—and naturally not, because Jupiter hadn't ejected it yet! He also insisted that his hypothesis predicted certain celestial phenomena, including the great heat of Venus (a result of its violent ejection from Jupiter), which had been observed by *Mariner 2.* Velikovsky's claims led to his showdown with Sagan, who, of course, had his own ideas about the Venusian hothouse.

*Worlds in Collision* blatantly violated the laws of physics. Although Velikovsky had certain scholarly credentials (he was a Russian-born psychoanalyst), he "had only the vaguest understanding of such basic physical principles as conservation of angular momentum, gravity, and entropy," wrote the physicist Lloyd Motz, who was on friendly terms with him. Velikovsky described celestial objects behaving in ways that they simply cannot behave—*unless* something is terribly wrong with modern physics textbooks. For example, Motz noted, to expel Venus, Jupiter would have had to "release or expend in a matter of seconds or minutes as much energy as our Sun emits in more than a year." Such an eruption would have expelled enough energy in those few seconds to have vaporized most of the planets, including Earth.

When physicists cited these huge discrepancies between Velikovsky's hypothesis and physics doctrine, he shrugged and replied that his historical research showed that celestial objects behave in previously unknown ways, and that therefore it was physics that would have to change to accommodate his findings. Throughout history, of course, scientists have proposed radical new theories that violated the commonsense physics of their time, yet proved (on the whole, despite some technical errors) to be correct. Copernicus's heliocentric hypothesis is one example; another is Alfred Wegener's concept of continental drift. In both cases, physics was modified to accommodate the heretical idea.

Velikovsky's theories, however, do not even fall into the category of science. Archaeologists and ancient historians have totally repudiated his interpretations of ancient records. Even if the records backed him, his predictions and calculations are not of the rigor that true science requires.

How does one distinguish a bona fide scientific hypothesis from a pseudoscientific one? The classic response is that of philosopher Karl Popper, that no hypothesis can be considered "scientific" (which is not necessarily the same thing as saying it is "true") unless it generates predictions that are conceivably disprovable ("falsifiable," in Popper's term).

Velikovsky's work raises two key questions: Were his original hypotheses conceivably falsifiable? And have they subsequently been falsified or verified by astronomical observations? If falsifiable but verified, then our knowledge of astrophysics must be seriously incomplete. If not falsifiable, we can confidently toss his notions into the historical wastebin along with dusty tracts on phrenology, spiritualism, sea monsters and other flummery.

A hallmark of pseudoscientific hypotheses is their vagueness and malleability: their proponents always manage to think up ad hoc ideas to "explain away" discrepant data (for example, the "Mars face" enthusiast who claims NASA hides photos of the "face," the parapsychologist who blames negative results on "bad vibes" from skeptical observers, and so forth). Occasionally ad hoc explanations turn out to be correct, but the burden of proving them must rest on their proponents. Orthodox scientists are simply too busy wrestling with acknowledged mysteries to waste time chasing will-o'-the-wisps (especially those proposed by scientific ignoramuses that brazenly transgress well-established scientific principles). Yet Velikovsky—despite his obvious ignorance of physics—angrily insisted that the burden of proof lay on his critics. It was not his job to prove his theory; it was their job to disprove him.

Velikovsky and his reverential fans presented Sagan with a challenge that, in his newly emerging role as defender of the scientific faith, he simply could not refuse. Sagan decided to combat Velikovsky in something of a scientific duel—a public debate in which Velikovsky could make his case, while a panel of scientists, Sagan included, could critique them.

This was a radically different way to confront pseudoscience. True, the UFO symposium at the AAAS symposium of 1969 had pitted UFO advocates against detractors, but all were bona fide physical scientists. Velikovsky, by contrast, had no significant training in the physical sciences; his books implied that the "expertise" of his critics was a sham, that his historical scholarship was just as valid a source of knowledge about the natural world as their professional training in physics and astronomy. In other words, the Sagan versus Velikovsky debate promised to be a particularly extreme form of "turf battle"—a

fight over who deserves recognition as an "authority" in a given subject. The history of science is full of such turf battles; they often decide the fate of fundamental ideas.

The Velikovsky debate certainly differed from the usual old-fashioned scientific responses to pseudoscience: ignore it or suppress it. Sagan—a fierce devotee of free speech—believed that astronomer Harlow Shapley's boycott of Velikovsky's initial publisher had been unjustified. The AAAS public debate would constitute, in effect, an apology to Velikovsky, giving him the opportunity to submit ideas to direct scientific scrutiny. The debate's ultimate goal was not to reassess Velikovsky's ideas (hardly any scientist took these seriously) but, rather, to reassure the public of science's basic fairmindedness, at a time when a growing number of leftists and academics were depicting it as intellectual camouflage for ideological and social prejudices.

* * *

Some AAAS members, of course, opposed holding the debate. "Certain powers in the AAAS didn't want the symposium to happen," recalls Sagan's friend Don Goldsmith, an astronomer who helped organize the debate. "They felt, 'We've had enough bullshit from this guy [Velikovsky]. AAAS is for science, this is non-science.'" However, the AAAS president at the time, Margaret Mead, thought the symposium would be worthwhile. She was an anthropologist famous for her affectionate studies of non-Western culture, and she apparently viewed the pseudosciences as many social scientists do—as generally harmless alternative perceptions of reality, which should be tolerated (if not accepted) as one might tolerate, say, Azande cosmology or Eskimo marriage rituals. Besides, Mead was quietly interested in fringe science. In 1969 she had pushed the AAAS to accept the Parapsychological Association as an institutional member; late in life, she served on the board of J. Allen Hynek's Center for UFO Studies. Says Goldsmith: "Whereas physical scientists thought, 'why should we give this bullshit a hearing?', Margaret Mead was of the anthropological bent. . . . She felt this might be interesting whether it's true or not."

The symposium was held on February 25, 1974, in the Grand Ballroom of San Francisco's St. Francis Hotel. There were seven speakers, two of them pro-Velikovsky—Velikovsky himself and the Illinois scientist Irving Michelson. (There were only these because no other pro-Velikovsky scientists could be found.) The room was packed. As Don Goldsmith recalled, "It is hard to outdo the spectacle of a seventy-seven-year-old gentleman rising to confront the critics who had rejected him for scores of years, with his supporters in the audience cheering his wit and hissing at his opponents, while his detractors sat applauding and protesting in opposite phase."

The astronomer Dale Cruikshank attended the debate to see what he calls the "clash of the titans"—Sagan versus Velikovsky. And indeed it was Sagan who dominated on the anti-Velikovsky side. "I'm not sure who won on the arrogance side, but they were both in top form," Cruikshank recalls wryly. Velikovsky "was an elderly man, tall and slender, big head of gray hair, and he sort of swept in with two or three people in his entourage, each of them carrying a big bundle of papers. And whenever he would snap his fingers somebody would run up with another document to support the point he had just made." During his address, Velikovsky presented the full set of his so-called "predictions" and then declared defiantly that "Nobody can change a single sentence in my books." His supporters in the audience stood and applauded.

Sagan was coolly composed by comparison. In the view of many present, his talk was a blend of intense analysis and amiable wit, with imaginative arguments so compelling that they seemed unanswerable. One of his key points was that Velikovsky's most heralded "prediction," that Venus was hot, was not a prediction in any meaningful sense of the word. Velikovsky claimed that he had anticipated Venus's great heat long before the *Mariner 2* space probe flew by the planet in 1962 and gathered data to that effect. The trouble with this claim is multifold. First, Sagan pointed out, Velikovsky never defined precisely what he meant by "heat." To say Venus is "hot" is like saying the Sun is "big." *How* hot? A specific temperature is not needed—just a range will do: say, 600 to 800 degrees Kelvin? Yet Velikovsky never provided this. Second, Sagan highlighted, Velikovsky never provided a convincing explanation of why Venus would be hot. He implied it was because of the heat experienced by Venus on being ejected from Jupiter, although (as Motz previously explained) in fact this would have vaporized it instead. Finally, such a prediction is of questionable meaningfulness, Sagan argued. People before Velikovsky had known that Venus is hot, partly based on its closeness to the Sun and partly on its atmosphere (Rupert Wildt's 1940 suggestion of a greenhouse-driven high surface temperature). So Velikovsky's "prediction" was not a true prediction—not even a lucky guess. His overall theory was so maddeningly vague, Sagan concluded, that it was impossible to use it to make any meaningful predictions at all. Hence Velikovsky's theory was classic pseudoscience.

Opinions of Sagan's performance vary. Staff writer Robert Gillette of *Science* magazine later described Sagan as "Velikovsky's bete noire . . . An articulate man with a switchblade wit. . . ." A reporter from *Science News*, however, observed: "Sagan's 56 pages of criticism would ordinarily be sufficient to lay to rest for all time such a picked-apart theory, but Velikovsky's supporters are not easily dissuaded, and the controversy is sure to continue." In fact, Sagan's speech trounced Velikovsky. Nowadays, the pseudoscientific psychoanalyst is largely forgotten, save by a handful of devotees who haunt the World Wide Web. Sagan remains their leading bete noire.

* * *

Was Sagan's campaign against the forces of pseudoscience really worth his time? After all, Von Däniken and Velikovsky were just the latest variations on old themes. Pseudoscientific and occult ideas are as old as the hills. Yet in the 1970s, their growing popularity—coincident with the rise of various cults (from the silly "pyramid power" to the scary Scientology) and the decline of student interest in science—alarmed many. In response, philosophy professor Paul Kurtz, a controversial figure within the American Humanist Association, formed the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP, pronounced "sigh-cop"), with the goal of challenging the intellectual merits of pseudoscientific and occult notions.

Sagan was a founding member of CSICOP. Certainly he was attracted to the skeptics movement by his scorn for pseudoscience, and by his desire to educate the public about real science. He might also, however, have joined the skeptics movement partly to reassure his colleagues—the Donald Menzel types who suspected his loyalty to orthodox science—that he really was a loyal (if highly speculative) member of the epistemological mainstream, and not a budding Lilly or Hynek about to saunter off to fairyland.

At the same time, Sagan would always feel ambivalence about certain elements of the skeptics movement. Some of its members were too fanatical, too lacking in "compassion" (as Sagan complained) for those deluded by foolish ideas. He refused to sign astronomer Bart Bok's anti-astrology petition because, in Sagan's view, its tone was too authoritarian; in an age when the public increasingly distrusted "experts," astrology buffs would not be converted to reason by an elitist-sounding petition signed by a band of astronomers. More subtle means were required to combat pseudoscience. One must not talk to the people as if they are children babbling about Santa Claus; they must be educated, patiently and respectfully so. And for that educational mission, Carl Sagan was ideally suited.

* * *

The *Cosmos* television series is the achievement that finally fixed

Carl Sagan's place in the celebrity firmament. With assistance from Ann Druyan and a team of others, Sagan told the saga of our universe —"all that is, ever has been and ever will be." The thirteen-part series was eventually seen by more than four hundred million people and became a spectacularly successful book (still in print today). It inspired countless teenagers to consider science careers. Most significantly for Sagan, *Cosmos* gave him the celebrity status that later allowed him to challenge the revival of cold war militarism, which he and many others believed threatened terrestrial life. The series was the climax of his ascent into fame, even into iconic status in American culture. From the broadcast of the series on, his face was immediately recognizable to the generations of Americans who huddled in their living rooms raptly glued to their TV sets for each episode.

With Sagan's striking, strangely halting and melodic voice and his emphatic gestures, he was the perfect scientific sage on screen, the entrancing visionary who could reveal the marvels of the universe, from the smallest grain of sand to the most distant stars. One journalist who wrote about the series described his unusual appeal by commenting that Sagan's "face combines hauteur, sensuality, and a winning boyishness—a pleasing amalgam of Rudolph Nureyev and George Plimpton."

* * *

The bad news started coming in batches. NASA's SETI project did not long survive the Cold War; its sudden death—only months after its birth—unhappily vindicated one of Carl's oldest worries: that the public's inability to distinguish between UFO claptrap and SETI science would doom the latter.

In early 1993, Senator Richard Bryan, a Republican from Nevada, stood on the floor of the Senate and asked his colleagues to kill SETI. Showing no ability to distinguish between SETI and UFO-chasing, he referred to SETI as a "great Martian hunt." The Senate went along; all SETI funding was ended.

After it all ended, SETI scientist Jill Tarter flew home, crushed. "I literally asked my husband to stay around over the weekend and not go into his office and not leave me alone with any sharp objects," she recalls with a laugh. "It was pretty grim. How could we have screwed up so badly? How could we have let this happen?" Fortunately, the SETI program was privatized and has since survived with support from Silicon Valley industrialists and other sugar daddies. Based at the SETI Institute in a tree-shaded office park in Mountain View, California, the search is conducted under the name Project Phoenix—after the mythical bird that ascended from its own ashes.

It was the same scenario that Carl had envisioned in his book *Contact*, where Ellie Arroway, abandoned by a federal scientific agency, seeks support for her SETI project from a private donor. The whole episode illustrated one of Carl's oldest fears—that poor science education would create a society unable to distinguish between scientific exploration and pseudoscientific flummery.

* * *

What is a visionary? Carl Sagan measured time in eons and space in light-years; he maintained an interplanetary perspective. To such a person, the petty bigotries and tyrannies of terrestrial life are provincialism in the extreme, utterly absurd. That was the core theme of another book, *Pale Blue Dot*: Ours is one planet in a vast cosmos—who are we to subdivide it into the privileged and the oppressed? "He took science so seriously, so deeply to heart," Ann Druyan says, "he understood the human species to be precisely what it is—part of the fabric of nature, obviously related to the non-human primates in ways that were very striking. So to him racism was completely appalling. And sexism, too. Since there was no scientific basis for any kind of inferiority for women or non-white people, he couldn't bear it. . . .

"That was true in our relationship, personally, in terms of arguments we would have," says Druyan. "[There were] no arguments 'from authority,' no 'Because I say so' or 'Because I want it this way.' He was really concerned about the truth. So you had a sense that not only would every problem ultimately be solved— because it was a process of getting at the truth—but that this guy wanted to keep on growing for the rest of his life! He didn't want to settle for the boring rituals and repetitions that most people are happy with. For him what mattered was what was true, not what would affirm his cherished belief. That's what the real dream of science is: not the universe is as I want it to be, to make myself less afraid of the vastness, but the universe as it really is." □


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# The Millennium Thought Contagion

## *Is Your Mental Software Year 2000 Compliant?*

*Thought contagions are beliefs that program for their own copying in humans much as computer viruses do in computers. Their self-spreading effect explains the techno-apocalyptic ideas swirling around the Y2K bug, including secular hell-doomsday ideas, logic-resistant strains of myth, and embedded rumors. Educating people about this can reduce the hazards of mass failures in "mental software."*

AARON LYNCH

If digital electronics had arrived 100 years earlier, then the multifarious hodgepodge of problems called Y2K (Year 2000) would have gone by a completely different name, perhaps Y19C, Y1900, or even C-20. As a *century* rollover problem, it only strikes by coincidence at the dawn of a millennium. Yet we also have a "bug" that really does relate to the turn of 1,000 years. It does not lurk amid the transistors or databases, the ROM memories or old vacuum tubes. It inhabits the minds of human beings. It is not a problem with how our brains track time; it arises from a weakness in how we share information among each other. It is the millennium thought contagion.

Thought contagions resemble computer viruses in one key respect: they "program" for their own transmission. Such beliefs self-propagate by inducing evangelism, abundant child raising, and dropout prevention. Beliefs harnessing these human functions most effectively out-propagate the "weaker" variants. Evolving like life forms through natural selection, thought contagions vie for ever-stronger influence in human lives. Numerous ideas about health, religion, sex, family life, investments, politics, and paranormal claims are affected.

The similarities to biological replicators inspired zoologist Richard Dawkins to coin the word "meme," rhyming with "dream," to denote a gene-like or virus-like unit of culture.[1] Although thought contagion theory does not depend on having the word "meme," the word does serve as convenient shorthand for items of brain-stored culture. An increasingly robust theory known as memetics can express this in mathematical and symbolic terms without biological metaphors. However, it does not take equations to see that memes exert major effects on information quality of society, in matters ranging from astrology to doomsday beliefs.[2]

## Millennial Panic

Millennial panic derives much of its contagion from a synergy with ideas about hell. The religious vision of hell has long motivated believers to spread their thoughts in order to save family and friends, making it a distinct thought contagion in its own right. The idea that "the end is near" implies that one must *hurry up* and spread the beliefs, so the combination spreads faster. As the year 2000 approaches, a secular version of the hell-doomsday combination spreads the same way. This is the infectious panic swirling around Y2K. Predictions that all sorts of vital systems will suffer unrecoverable and catastrophic failure emanate from many sources. As with religious belief, ideas of "hell on Earth" spur the most retransmission efforts. Many, for instance, have come to believe that electricity, water, fuel, and food supplies will collapse irreversibly. Airplanes will plunge from the skies. Nuclear weapons will launch at the stroke of midnight. And if the weapons don't fly, then financial chaos will still cause mass starvation and food riots. And so on. A January 1999 TIME/CNN poll found that 59 percent of Americans were somewhat to very concerned about Y2K, while a remarkably high 9 percent were expecting "the end of the world as we know it," or *TEOTWAWKI* in Y2K jargon.[3]

Those accepting the direst predictions have a strong sense that time is running out, since they expect the catastrophe to start immediately after 1999. Survival thus depends upon evacuating urban centers, stockpiling food, drilling water wells, and so forth. But one must first *believe* in the Y2K cataclysm to be saved. As with the religious End Times memes, the secular strains naturally move believers to save friends and loved ones. So doomsday believers urgently spread the dire news of "what lies ahead" in January of 2000. Their extreme predictions spread widely when combined with American survivalist memes, which give detailed instructions for how to save oneself. Like an evangelical religion, the meme package effectively says, "Convert, and you will live." Meanwhile, those who know that prosaic life will continue generally feel unmoved to go forth and tell everyone about it.

The term *TEOTWAWKI* helps secular and quasi-secular doomsayers distinguish their message from pure religion. In some, the meme arouses fantasies of joining the few survivors to inherit the world. The selfishness of the appeal helps it spread. The *TEOTWAWKI* idea also differs enough from earlier religious thought that adherents try to persuade people ranging from atheists to Pentecostals. The wider base of "eligible" recipients helps the meme spread faster.

## Spreading the Panic

Once someone acquires the Y2K "hell on Earth" belief, the meme serves itself by deterring dropouts. Like the religious threat of fire and brimstone for those who renounce faith, the secular belief threatens terrible things for those who "erroneously" change their minds. These include visions of starvation, violence, and death to oneself and loved ones. Such dropout prevention helps the belief not only persist, but also spread. Persistent belief enjoys more copying than momentary belief.

When new listeners hear the "hell on Earth" warnings, the meme can manipulate their thinking toward accepting it. Like religious hell memes, the Y2K hell memes imply vast suffering for misplaced skepticism but little penalty for misplaced credulity. Thus the memes of doomsday with hell on Earth achieve the three ingredients of major thought contagion: high transmission rates, receptivity in potential converts, and persistent belief in existing converts.

The doomsday belief is also more vivid and emotionally gripping than the prosaic belief. When infected by a vivid, emotionally gripping meme, people have a hard time setting the thought aside. They keep thinking and talking about what it means to them. So the vivid, gripping meme provokes more retellings per week than does the prosaic, boring meme. If meme A compels sixty minutes of thought per week, and meme B compels just six minutes of thought per week, then this alone could cause up to ten times more tellings per week for meme A. The growth advantage is compounded weekly for a very fast contagion. Like the effect that powers those vivid, gripping stories called urban legends, it adds to the contagiousness already caused by thinking that "time is running out."

Further dissemination comes from news writers, reporters, book authors, and movie producers who seek out vivid, gripping stories. Most of us already like telling exciting stories instead of dull ones, because we crave the extra attention it brings. The only difference with media professionals is that they earn cash for the attention they generate. Those who receive boring news tips or discover bland realities usually know better than to do a story on it. Rather, when they find

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*Aaron Lynch is author of the book* Thought Contagion: How Belief Spreads Through Society *published by Basic Books in 1996. This article is adapted from a longer version on his Web page at http://www.thoughtcontagion.com.*

alarming or sensational ideas, they know they have marketable material. As writers and reporters catch news memes from each other, the effect feeds on itself to produce escalating intensity in everything from royalty scandals to urban legends. Serious topics like Y2K are often distorted in the process.

Even those of us who conscientiously refrain from sensationalizing stories can unwittingly impart extreme ideas about Y2K. It simply takes less time and effort to explain the worst case Y2K situation than it does to explain why the worst case often does not apply. It also takes more time to explain that many systems such as power plants, water filtration systems, and oil refineries can be reset to fake dates and operated even if they do have date-sensitive software. This makes it easy to mislead people and listeners into thinking that *everything* digital will fail unrecoverably at the stroke of midnight.

**Y2K alarm dissemination comes from news writers, reporters, book authors, and movie producers who seek out vivid, gripping stories. Most of us already like telling exciting stories because we crave the attention it brings. The only difference with media professionals is that they earn cash for the attention they generate.**

Many "embedded" thought contagions accompany the general apocalypse meme, and arise for the same reason. For example, if someone concludes that Russian nuclear missiles will launch at the stroke of midnight, he tends to keep thinking about it. Eventually, he may conclude that he must warn people to get out of the cities and escape an imminent nuclear hell. His belief out-propagates the belief of someone who knows about the key role of silo operators in launching a missile.

Another "embedded" thought contagion is the idea that civilization will end if the power grid goes down—an electric apocalypse. Even though societies have survived air wars that devastated infrastructure, most of us today have not. This leaves the electric apocalypse widely believable, helping the urgent warnings win converts.

Even embedded myths sustain layers of more deeply embedded myth, such as the notion that gasoline cannot be pumped in a power failure. In an emergency, mechanics could easily re-route the plumbing and re-power the station's air compressor with a gasoline motor, or simply use a generator. But the idea that gas won't flow without electricity is simpler to express and provokes more urge to warn others. Furthermore, most listeners lack the mechanical knowledge to reject it. So visions of an America without gasoline spread widely in the world of Y2K lore.

## Secondary Catastrophic Prophecies

Along with these apocalyptic memes come a variety of lesser catastrophic prophesies. Many, for instance, worry enough about the banking system to plan large cash withdrawals—even though the banking system has done an excellent job of fixing Y2K problems. Those who expect a banking cataclysm spend more time thinking about it than those who expect banking as usual. They may also feel motivated to spread their beliefs in order to get friends and loved ones to pull their money out. Yet the limited supply of currency in today's banking system will protect it even from self-fulfilling prophecy of bank runs. Long before being forced into insolvency, the banks would run out of currency and pay all large withdrawals by cashier's check. But the only thing to do with a cashier's check is take it to another bank, so customers would stop making large withdrawals. Some people could be inconvenienced by a temporary currency shortage, but the banking system would survive.

Even institutions that publicize their Y2K fixes still face memetic problems. If a large bank, for instance, says it has brought its computers into compliance, some listeners will doubt it. They'll say the bank is in denial, attempting a cover up, or engaging in conspiracy. Others will sound the alarm unless they see overpriced "proofs" of compliance. These ideas are more frightening and mentally gripping than bland expectations of normal banking in 2000. So the cynical memes about the bank spread quickly on open media such as the Internet.

The conspiratorial variants also resist logic. The information equivalent of multi-drug resistant bacteria, such memes prosper because there are few kinds of facts that could possibly "kill" them. After all, trying to refute a conspiracy theory can get you dismissed as either a victim or participant. So multirefutation-resistant strains keep the banking apocalypse meme going strong, especially in those who already engage in conspiracy thinking. Logic-resistant strains emerge for the overall apocalypse meme as well, creating public challenges to more than just banks.

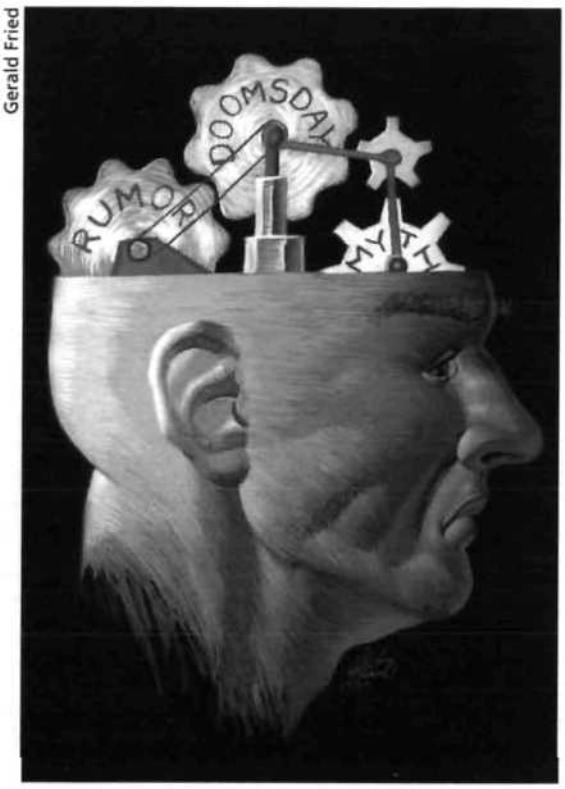
Refutation resistance also comes from regarding the non-doomsayer as a Pollyanna. Those who learn to apply this word to anyone doubting the apocalypse can easily reject challenges to their beliefs, and retain the belief and the sense of urgency longer. That, in turn, helps doomsday movements spread faster and faster, and makes the word *Pollyanna* unusually common in Y2K discussions.

The psychological term *denial* also works this way. Used ever since Freud described four defense mechanisms, the term describes how real people often react to threatening thoughts. Yet doomsayers can allege "denial" far easier than non-doomsayers can ever disprove it. The non-doomsayers presumably have to explain all the details of why society will continue to function just to clear that single term "denial" from the discussion. Besides, denying denial is still "denial," making it perhaps the perfect source of refutation resistance. "Denial" thus becomes central to Y2K meme complexes that people have not dropped, and helps those meme sets survive and spread.

Thought contagions permeate online technology forums as well. If an engineer knows a solution to a critical problem, she may work diligently to solve it, perhaps marketing the fix to cor-

porations through a new consulting business. But if someone else hastily decides that the problem has no solution, he may feel compelled to warn people. Others feel compelled to publicize problems that don't exist. They might, for instance, think that today's cars incorporate date information in the engine timing, and announce that cars will suddenly stop at midnight. Since public Internet forums are open to postings by non-experts, the misbeliefs and erroneous information that inspire retransmission are well represented. So even the "high tech" forums act as reservoirs of infection for information viruses.

Not surprisingly, some of those proclaiming the end of the world are also experts in such high technology fields as computer programming. People in many professions regard their line of work as the most important, or nearly the most important, in society. Programmers and electrical engineers are no exception. This belief can make them emotionally receptive to suggestions that society will collapse if malfunctions hit whole categories of their products. Normally sharp thinkers can therefore become uncritical of extraordinary claims swirling around Y2K. Once they accept such claims, the same professional pride can lead them to spread those thoughts. An engineer saying the world will end from a crashed product line is a roundabout, unconscious way of declaring, "My profession is crucial!" The thought contagion reinforces itself, too: once some technologists express the *TEOTWAWKI* meme, it becomes more credible to other technologists. Though a minority among their colleagues, they help spread the meme to those lay people who regard technologists as automatic "experts" on the societal impact of Y2K.



Gerald Fried

## Calls to Action

Investing heavily in a meme makes the meme harder to shake off. People who have gone so far as to relocate, sell assets, stockpile food, and persuade friends find it hard to believe that their alarm might have been unfounded. Instead, they may include themselves in the minority "smart enough" to prepare for *TEOTWAWKI*. This helps the meme spread by keeping the host contagious longer. For many, recovery will not happen until the year 2000. Even after calamity fails to strike that year, some will continue believing in the wisdom of their actions as "better safe than sorry." Those who sounded the most dire warnings will likely even take credit for saving civilization by pressuring sluggish organizations to act.

A less drastic version of the Y2K preparation movement calls for action focused on a community level instead of moving to remote cabins. Such an approach is generally more constructive, but still thrives on the contagiousness of dire predictions. The main difference is that this type of Y2K movement tells its adherents that to save themselves, they must save their communities. That means going forth to persuade as many neighbors as possible in order to launch community-wide preparation efforts. It has the benefit of making communities more disaster-resilient and competes for adherents with isolationist messages. Yet the people most motivated to spread the movement in the community are often still the ones with unrealistically dire expectations.

In some cases dire warnings will have spurred sluggish bureaucracies into fixing their software. In other cases, dire warnings will interfere with work, inspiring key employees to quit and head for remote cabins. In effect, it gives programmers mental software that bogs down in an endless loop of terrifying thoughts. Apocalypse warnings may leave some administrators thinking, "If this message is true, then I have no reason to rouse myself to elaborate action, because my organization has no function in a collapsed civilization." Others may conclude that the whole thing was just hype and hysteria. In other words, irrational beliefs about Y2K act as conceptually "weakened strains," immunizing some people against the idea that there is any problem to fix at all. Such effects may have slowed software fixes and made Y2K worse, not better. To the panic-stricken, the occasional "Y2K-denyers" looked like captains of the *Titanic*—and "proof" that a catastrophe really would strike. That, in turn, has strengthened the urge to spread dire warnings.

Y2K apocalypse memes thrive on pre-existing religious doomsaying. Endemic beliefs that the end is near make it easier to think that deadly sin of digital sloth will hasten the end. Fundamentalists who see the fading plausibility of apocalypse coming from the Soviet "evil empire" can turn their attention to the technocrats. So the belief in a technological debacle spreads vigorously in many religious circles, producing some of the loudest Y2K doomsayers. They include conservative Christian activist Gary North, who widely proclaims the Y2K apocalypse in computer terms that persuade even the non-religious. Meanwhile, the secular doomsday meme renders its hosts more susceptible to religious evangelism. Many evangelicals point to the millennium bug as a sign that they and the book of Revelation were right all along. Religious hell memes help the evangelism work, since they imply infinite suffering for mistakenly "rejecting Christ" but little penalty for mistakenly converting. In any case, even the most atheistic doomsaying has roots in religion. After all, a religious thought contagion got us

counting the years since the birth of Jesus in the first place.

When the year 2000 arrives, many evangelicals who thought the Y2K bug would play a role in the End Times will revert to the more date-neutral Adventism they held before the software story broke. We should, however, expect some extreme cults to have serious problems with a world that refuses to end. We should also expect a few groups to believe not only that the End Times are upon us, but that they have a divinely ordained role in causing it. This could mean a cluster of strange events such as the Heaven's Gate tragedy and the Tokyo attack by the doomsday cult Aum Shinri Kyo. Some of these will happen after January 2000, owing to such things as estimates of the birth date of Jesus and the legacy of starting a millennium on 1 A.D. rather than 0 A.D.

**We should expect some extreme cults to have serious problems with a world that refuses to end. We should also expect a few groups to believe not only that the End Times are upon us, but that they have a divinely ordained role in causing it.**

The rest of society will also have many people hearing of "the coming anarchy." Unfortunately, some will act accordingly, despite an increased police presence. Being infected with a belief that "the end is near" can make the criminal element more active, since apocalypse implies no penalty for getting caught. A few people may even *try* to foment chaos, for the simple reason that they have prepared so well for it and do not want their efforts and emotional investment wasted. With extremists viewing Y2K as deliverance from an evil social order, a few may even try to hasten the apocalypse through sabotage. We thus have two problems on our hands: the century bug of the computers, and the millennium thought contagion of the human mind.

Explaining the technological details of why modern life will not collapse will remain an important aspect in countering Y2K hysteria through the end of 1999. Yet many people need what amounts to a combination therapy: they need to see not only the fantastic scenarios refuted, but also why millions of people *can* all be wrong about it. Asking how an idea was acquired can help in spotting irrational thought contagions and mounting an immune reaction. Thoughts that come from others, that are hard to set aside, and that make one impatient to tell new people can be recognized as likely thought contagions. Learning to spot them makes it easier to pause for research before believing or spreading them. This also helps with all sorts of irrational ideas aside from Y2K. Rational inquiry in general can be advanced if more people learn to think about their roles as infectious information carriers. For this, Y2K presents a unique educational opportunity, since the contagious myths will have lasted only a year or two in most cases. Starting in 2000, millions of former doomsayers will have a chance to think about the hysteria in hindsight as a lesson in mass delusion. If we take time to discuss the social phenomenon after it passes, the insights learned may benefit the information quality of society well into the next century.

### Notes

1. See Dawkins, Richard. 1976. *The Selfish Gene.* New York: Oxford University Press.

2. For a nontechnical application of memetic science to numerous areas of mass culture, see Lynch, Aaron. 1996. *Thought Contagion: How Belief Spreads Through Society.* New York: Basic Books. For further applications and technical papers, see *Thought Contagion Memetics* http://www.thoughtcontagion.com. For a recent scientific discussion about memes see Blackmore, Susan. 1999. *The Meme Machine.* Oxford University Press.

3. See Lacayo, Richard. 1999. The end of the world as we know it? *Time,* January 18, 60–70. □

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# 'Debunking the Debunkers'

## *A Response to an Astrologer's Debunking of Skeptics*

*An article published in* The Mountain Astrologer *in the fall of 1998 claimed to rebut criticisms of astrology by debunkers. An examination of the astrologer's arguments shows that astrology has almost no resources with which to respond to critics.*

I. W. KELLY

The August-September 1998 issue of the magazine *The Mountain Astrologer (TMA)* contained an interesting article entitled "Debunking the Debunkers" that attempted to rebut many criticisms of astrology. The author, Valerie Vaughan, who has a master's degree in information science, has been a practicing astrologer and a writer on astrological topics for twenty-five years. Vaughan defines debunkers of astrology as diehard skeptics who "actively reject and even persecute astrology" (1998, 12). They are usually ignorant, misinformed, and "persist in running tests specifically aimed at discrediting it" (1998, 12). Vaughan's article attempts to turn the tables and debunk the debunkers. Since many of her responses are representative of what is

in the astrological media, a critical examination of them may be worthwhile to SI readers. I will also allude to other astrological writings where relevant.

The main debunkings of astrology that Vaughan rebuts are:

1. Astrologers fail to do research
2. Astrologers ignore the scientific approach
3. Astrology lacks scientific evidence
4. Astrologers disagree on fundamentals and
5. Astrologers appeal to whatever is fashionable

I will examine each debunking-and-rebuttal in turn.

### Astrologers Fail to Do Research

Vaughan points out that one of the most common criticisms of astrology is the failure of astrologers to design research studies and run controlled statistical tests to examine their claims. Her answer is "Research is an extremely time-consuming and expensive endeavor" and astrologers are "outside the academic mainstream with no access to research funding" (1998, 12). Vaughan neglects to inform her readers that there already exists a large amount of scientific research conducted by astrologers, sympathetic scientists, and critics. The results have been accumulating since the 1950s. Most of them are bad news for astrology, with many of the studies conducted by astrologers just as negative as those by critics. A number of books and articles have reviewed these studies (Dean and Mather 1977; Eysenck and Nias 1982; Culver and Ianna 1988; Ankerberg and Weldon 1989; Dean, Mather, and Kelly 1996; Kelly 1997; Martens and Trachet 1998).

Her article also fails to note that astrologers generally have no training in how to conduct or evaluate research and therefore could not do it even if they had funding. Training institutions and courses for astrologers do not require exposure to research methods or even require any knowledge of the research literature on astrology, yet those elements are indispensable in other disciplines. Even massive cash incentives of up to $5,000 (U.S.) have not motivated astrologers to produce evidence for central tenets (Dean and Mather 1985).[1]

### Astrologers Ignore the Scientific Approach

Vaughan's own complaint about funding is later undermined when she shifts ground and tells us that (statistical) scientific research is inadequate to test the complexity of astrology:

> Scientists also insist on statistical analysis using random samples. But astrology cannot be proven or disproven using random samples because astrology is based on the premise that *conditions are never random.* For example, scientists might assume that any time is just as good as another to perform a test of astrology, but what if you're testing whether Pisces is less aggressive than Aries, and it so happens that Mars is rising during the test? Or suppose that preliminary research does reveal some validity in astrology, but in a later attempt at replicating the results, the Moon is void of course or Neptune is rising. Of course the results will be inconclusive (1998, 13–14).

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Vaughan is alluding to the importance of taking many astrological factors into consideration ("the whole chart") when interpreting birth charts. The characteristics a particular planetary configuration signifies can be made more or less pronounced (or can almost disappear) with the presence of other particular planetary configurations. Note the problem: If astrologers say that certain planetary configurations *tend* to coincide with certain characteristics of people, then that's a statistical claim. But if certain other factors make the observations inconclusive, how could astrologers ever have determined the meanings of the isolated planetary configurations in the first place, or confirm their viability in the present? Furthermore, if the supposed variation in time quality really did affect the quality of successive samples, we might expect the massive worldwide application of statistical quality control to have detected it by now. For example, according to astrology the uniformity of, say, steel plate or of single silicon crystals would change according to planetary configurations as well.

Vaughan's statement also indicates a very limited idea of what research is about: If I ask an astrologer to match up seven people with their horoscopes, believers expect them (and they themselves expect) to perform much better than chance. But research shows that they do not perform better than chance (Dean, Mather, and Kelly 1996; Nanninga 1997; Ertel 1998; Smit 1999).

A related objection to the scientific approach Vaughan describes as follows:

> Another problem with statistical analysis is that the zodiacal signs can spend different amounts of time on the horizon. People born at the latitude of London are three times more likely to have Scorpio rising than Pisces rising. This can seriously skew one's statistical results (1998, 14).

But this objection is trivial. Correction for rising sign duration is in fact very easy. (Gauquelin, and those investigating the "Mars effect" had to take into consideration far more demanding factors than Vaughan's simplistic example, such as the complex daily movements of Mars, along with a variety of demographic conditions.) If this is a difficulty for statisticians, consider how much more difficult it would be for astrologers who wished to check on the validity of astrological pronouncements or to decide between conflicting interpretations. Not only would they have to *statistically* obtain information on the rising signs but also somehow relate this information to the complexity of human behavior and sort out what human activity is related to what planetary configurations. The problem becomes almost insurmountable if, as many modern astrologers assert, planetary configurations reflect inner psychological states and structures. These astrologers (Archetype and psychological astrologers) contend that astrology can only provide interpretations of the inner life of human beings, which does not necessarily fit in with observable behavior nor with the client's introspections (see Kelly 1997 for a critique of psychological astrology).

### Astrology Lacks Scientific Evidence

Not only does Vaughan think that statistics is inadequate to test astrology, she suggests that scientific investigations into the

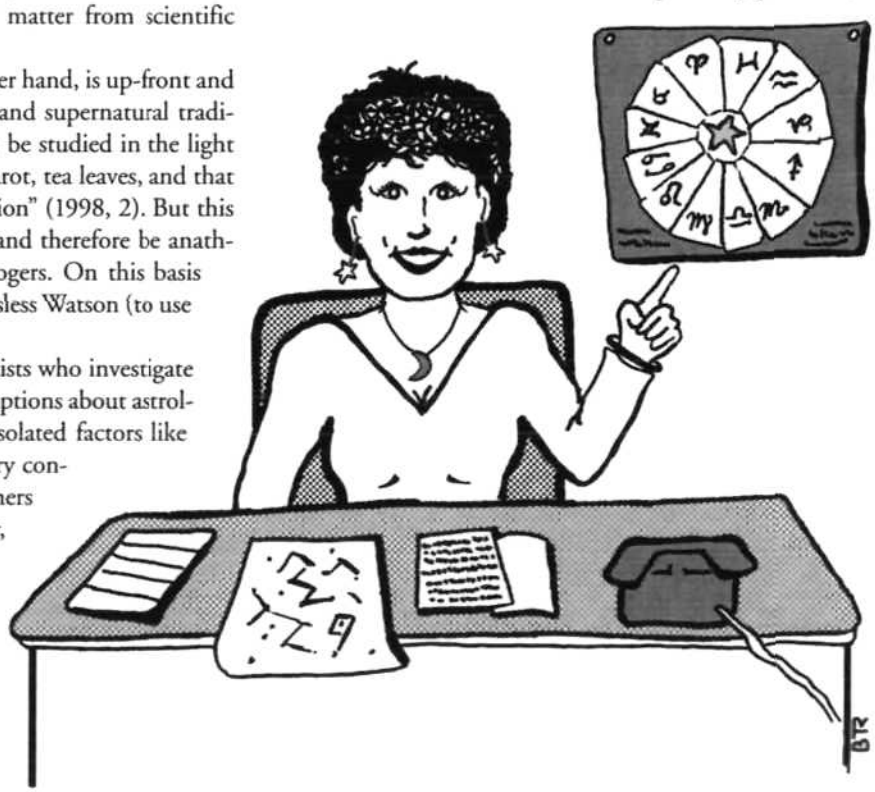
validity of astrology (and hence the lack of scientific evidence) may be irrelevant anyway: "debunkers insist upon testing astrology's metaphysical principles with scientific methodology. They might as well measure consciousness with a spoon" (1998, 13).[2] To describe something as metaphysical, by itself, is to say very little, except that in some unspecified sense, the claims are not amenable to scientific scrutiny. It is never made clear by Vaughan, or by most astrologers, how astrology is to be considered, or what kinds of evidence/reasoning are relevant when investigating its validity or usefulness. Vaughan, unhelpfully, tells us only that astrology is not a science "in the same sense as chemistry or physics" (1998, 13), although "it might be considered a social science" (1998, 13). On the other hand, it "functions more like philosophy in that it seeks knowledge of a broader reality that includes the metaphysical" (1998, 13). Here Vaughan is arguing that astrology is more like philosophy, so science (and therefore scientific evidence) is largely irrelevant. But her argument ignores the problem that if we seek knowledge of this broader reality we can still fail to find it, or be misled. What "tools" do astrologers find reliable here, and how would they know?[3] And when they have found the correct broader reality how do these tools help resolve conflicts between, or even within, schools of astrology? Vaughan does not tell us.

A further point here is that if astrologers reject scientific tests, why are they so accepting of experience (e.g., "my experience shows astrology works"), which (other than decreased carefulness) differs little in its subject matter from scientific investigations.

The astrologer Cornelius, on the other hand, is up-front and places astrology squarely in the occult and supernatural tradition: "it is a divinatory system that can be studied in the light of what we know about the I Ching, Tarot, tea leaves, and that whole gamut of practices called divination" (1998, 2). But this will come too close to fortune-telling, and therefore be anathema (at least publicly) to many astrologers. On this basis astrology seems destined to be a Holmesless Watson (to use Kai Nielsen's lovely phrase).

Vaughan proceeds to castigate scientists who investigate astrology as relying on "simplistic assumptions about astrology." For example, she says they test isolated factors like zodiac signs, the rising sign, or planetary configurations like Mars in Leo: "Practitioners of astrology know that no one factor, such as the Moon in Aquarius, can 'mean' anything in an absolute sense" since "this ignores the wholeness of a chart and of the person" (1998, 14). Those who do so are "totally unqualified to test astrology by any method" (1998, 14). Ironically, Vaughan violates her own stricture two pages later with the statement, "Scientist debunkers have entered the realm of public school education, but what else would you expect *with Pluto currently in Sagittarius*?" (my italics 1998, 16) and with her earlier reference to isolated factors such as 'void of course moon' and 'rising Neptune'![4] Furthermore, the astrologers writing in almost every article of *The Mountain Astrologer* are, by her own standards, astrologically incompetent. For example, in the same issue of *TMA* that Vaughan reminds readers about the maxim regarding the whole chart, one reads in a letter to the editor: "as a terrified Cancerian who had just survived a Uranus transit over my natal Saturn and Aquarius Ascendant . . ." (1998, 7). In one of the main articles, an astrologer writes "the Sun and Jupiter in the same sign show an individual who is religious or very authoritarian about religious pursuits" (Gomes 1998, 51). The *New Scope* (January 11, 1999) on the *TMA* Web site informs us that Robin Williams's "penetrating wit can be seen in his Mercury-Pluto conjunction which resides in the tenth house."[5] So much for Vaughan's claim that "Astrology is incredibly complex; there are innumerable variables which must be considered before an astrologer can confidently make a statement" (1998, 14).

In general, astrologers in their writings deny the importance of isolated factors. However, when consulting with clients and conversing at astrological conferences, the situation is quite different. For example, at any astrological conference one can overhear astrologers talk about "my Saturn, my Moon, my Sun," and make statements like "Yes, I gesture a lot but that's because I'm a Gemini," and, indeed, blame every little mishap in their lives on the behavior of natal planetary positions, tran-



Well, of course you're skeptical—you're a Taurus!

sits, progressions, directions, and so on. "I am a depressive introvert. You know, Moon conjunct Saturn, what else can you expect?" or "Pluto transiting my Sun has caused all sorts of problems in my life" or "We get on (or don't get on) because our Suns are in opposition" or "My car was stolen, because I had Neptune transiting over my Node"—conveniently forgetting that this transit took quite a few months to complete. However, it was the only transit that this astrologer could find. Well, there "had" to be a planetary culprit, so. . . ! Such comments are from practicing astrologers and readers of magazines like *TMA*.

While the whole chart is emphasized by astrologers when debating critics or explaining away negative studies, very few recognize that the whole chart is far too problematic for them to deal with (Kelly 1997; Dean, Kelly, and Mather 1999). So astrologers are forced to focus on whatever few isolated factors their experience (or their instructor's experience) has shown "works." Unfortunately, which factors "work" often varies from one astrologer to another, as an examination of articles in any issue of *TMA* or any other astrological magazine will readily confirm.[6] The interesting problem of how astrologers, on the basis of their experience, come to believe so passionately in differing nonexistent effects (as far as we know) is fully addressed by Dean, Mather, and Kelly (1996), in even more detail by Dean, Kelly, and Mather (1999), and in terms of fascinating parallels with phrenology by Dean (1998).

### Astrologers Disagree on Fundamentals

Next, Vaughan addresses the often-heard criticism that there is much disagreement among astrologers over basic ideas. For example, tropical and sidereal astrologers promote zodiacs that differ by almost one sign in position, so that one can believe a certain piece of sky means *intense* while the other side can believe the same piece of sky means *relaxed*. Her response is:

> In orthodox science, a lack of mutual agreement over very basic premises is considered a healthy expression of intellectual debate, and the opposing camps are hailed as 'different schools of thought'. Astrologers using different house systems are accused of inconsistency, while in physics one can discuss whether light is a wave or a particle. . . . In behavioral genetics, no one complains if biologists formulate competing options like "nature versus nurture." In medical science, doctors make a respectable living giving second opinions (1998, 12–13).[7]

At first sight this seems like a good argument. However, if astrology was a "young science" (like evolutionary psychology) or a relatively new discipline (like psycholinguistics), this argument would carry more weight. But (according to which astrologer is consulted), astrology has been around for between three and five millennia! Surely after all the millennia of (what we are told) the growth and refinement of astrology, there should be more agreement on basic tenets and resolution of outstanding anomalies! (Dean, Mather, and Kelly 1996; Kelly 1997; Spencer 1997). In contrast, many of Aristotle's observations and insights have survived to this day and can be defended and confirmed (Byrne 1997).

Consider what happens in physics, biology, medicine, and the social sciences: There are rules of methodology and evidence consistently applied worldwide that are used to help separate out valuable ideas from less valuable or false ideas. Indeed, astrologers use planetary positions based on the trustworthiness of many claims of scientific theory and observation.[8] By contrast, healthy intellectual debates are conspicuous by their absence in *TMA*, which seems to prefer polemics to criticism, and propaganda to serious argument and informed discussion. Textbooks in the physical, biological, and social sciences include research results and rigorous debate, whereas in astrology the opposite prevails—negative findings are ignored or vigorously explained away, and there is little, if any, attempt to synthesize research results (which are readily accessible to astrologers) and base new theories on them.[9] In short, if the disagreements in modern science were as serious as those in modern astrology, we would still be in the Stone Age.

In this regard, although the astrological research journal *Correlation* is published by a large society of astrologers, it is not widely read by astrologers, let alone its findings acted upon by them.[10] Furthermore, the disciplines in the sciences are also relatively compatible with each other, whereas astrology is not (no science is uncritically based on mythological connections) (Kelly 1997).

### Astrologers Appeal to Whatever Is Fashionable

Vaughan's final response is to the criticism of astrology for "Attempting to sell itself by associating with whatever latest theories have caught the public's imagination, such as mythological archetypes" (1998 13). Vaughan's rebuttal is

> Scientists, of course, do exactly the same thing. When [astronomer] E.C. Krupp publishes his monthly astro-mythology column in *Sky and Telescope*, it is considered an admirable attempt to 'bring science to the masses' (1998, 13).

But this rebuttal conflates two different issues. Krupp and others use public interest in mythology as a vehicle or motivating tool, not as a reliable basis for constructing complex theories about human behavior. For example, they might use zodiac signs to motivate interest in precession or the Hubble constant. Contrast this usage of mythology with the following astrological usage:

> Mr. [Ken] Starr's [Clinton's adversary] natal [birth] chart shows a Mars at 18 degrees Virgo square his Uranus at 20 degrees Gemini. Sakoian and Acker, in the *Astrologer's Handbook* (1987), tells us: 'This square tends to cause recklessness and dangerous sudden action. . . .' (Coschignano 1998, 9)

This reference to an isolated factor describes a relationship between a Western mythology-based interpretation of a planetary conjunction with cosmopolitan human behavior, something Krupp would never do.

It is pertinent to point out that some prominent astrologers would be in accord with critics here, that is, that astrologers appeal to whatever is fashionable to increase the credibility of astrology by association. For example, the astrologer Cornelius (1998) contends that when astrologers associate astrology with scientific and philosophical theories, they misrepresent astrol-

ogy as something it is not (i.e., a quasi-scientific or philosophical enterprise). He is worth quoting in full:

> Intelligent critics of astrology maintain that astrologers have always managed to use the prevailing culture and ethos of the times in which they live (the science and philosophy of their period) to disguise themselves and cunningly continue with their practices. This is absolutely true. . . .We disguised ourselves as Aristotelian science the better part of two millennia. Then we tacked ourselves onto modern science in the revival of two centuries ago when astrology disguised itself as magnetism and electricity, and later as radio waves. Depth psychology [Jungian archetype psychoanalysis] is just the latest disguise. Perhaps we can do nothing else, for how can this form of symbolism survive without being in the corrupt position of lying about itself in some way in order to get by? (1998, 3)

## Explaining the Behavior of Debunkers

As well as attempting to debunk the debunkers, Vaughan also provides three main explanations why critics "expend so much energy trying to disempower astrology," namely:

1. Critics cannot bear an unexplained phenomenon
2. Critics fear losing control
3. Critics are driven by scientism

I will now consider each in turn.

### Unbearable Lack of Explanation

Vaughan maintains, "The real problem is that scientific debunkers are intellectual control junkies who cannot bear the thought of a phenomenon they can't explain" (1998, 16). Vaughan never informs readers how she acquired this information, even though she is critical of debunkers who fail to provide supporting evidence for *their* statements about astrologers (1998, 17). Some debunkers, of course, might be as she says; but others might be debunking simply because the astrological claims they have come across are contradictory or are promoted without adequate support (and are therefore perceived as deserving to be debunked), in the same way that many claims about UFOs or psychic crime busters or suspicious medical treatments deserve to be debunked. There is no necessary connection here with debunkers finding the unexplained unbearable.

Also, as argued by Dean, Mather, and Kelly (1996), Dean (1998), Lillqvist and Lindeman (1998) and Dean, Kelly, and Mather (1999), straightforward nonparanormal explanations of why astrology works are already available that fit its known characteristics. If we can understand how astrology works without resorting to the paranormal, appealing to future science, or theorizing speculatively about the tidal forces of planets, then any reference to the applicability or inapplicability of scientific methods becomes moot, simply because there is little left to explain.[11] After all, in both everyday life and science, we would prefer, other things being equal, an explanation for particular puzzling phenomena that is consistent with our present confirmed theories, over more complex or esoteric explanations. (A strange knock on my door with no one present is more acceptably explained as due to wind, or a prank, or hearing error, than leprechauns or even a small meteorite.)

**Training institutions and courses for astrologers do not require exposure to research methods or even require any knowledge of the research literature on astrology, yet those elements are indispensable in other disciplines.**

### Fear of Losing Control

Vaughan's second, and related, explanation of debunkers' behavior is in terms of political class wars: "The war against astrology began as a *class war* and remains so today," a war driven by "power through funding. Astrology was driven from the ranks of the intellectual elite during the Scientific Revolution, pushed out by a rising class of professionals called scientists" (1998, 15). However, even if this was true, it does not explain why the scientists succeeded and the astrologers did not. Perhaps scientists produced the goods while the astrologers failed to do so. Or maybe because the contradictions and anomalies in astrology multiplied without end (ever since Sextus Empiricus, St. Augustine, Pico della Mirandola, and others signaled them centuries ago) making astrology a very unpromising research program (see Culver and Ianna 1988; Kelly 1997; Dean, Mather, and Kelly 1996; Martens and Trachet 1998). Most likely the ability of scientists to detect error in their theories, and the inability of astrologers to do so, had much to do with it (Kelly 1998). But there is nothing here about fearing to lose control, power, and status. Even if the struggle were entirely political, Vaughan does not appear interested in the possibility, consistent with her own reasoning, that astrologers obtained their earlier positions of power and influence by similar class wars.

### Driven By Scientism

Vaughan's third explanation is that debunkers are driven by scientism, the view that "the scientific method or rationalism is the best way, and perhaps even the only way, to gain knowledge about the world. 'World' here is defined as the material universe, which in turn is equated with 'reality'" (1998, 12). There are several problems with this explanation. First, as in the previous two explanations, Vaughan neglects to inform her readers how she knows this applies to debunkers.

Second, accusations of scientism are a common ploy by astrologers to deflate any scientific or philosophical criticism from the start. Ironically, the ploy ignores its counterpart, namely astrologism, which might imply the view that nothing else is relevant because astrology is the way, the truth, and the light, or that it is meaningful to describe isolated factors but meaningless to test them, or that sun signs are valid but a five-minute error in birth-time can make all the difference, or that,

given the right technique, astrology can explain everything.

Third, the thinking is patently invalid. It takes a relatively straightforward testable claim such as "does the birth chart match the person better than a control" and inflates it to a grandiose claim regarding "knowledge about the world." Scientific methods may not be the only approaches that contribute to answering questions about the second claim, but they seem to be a very reliable approach to the first.

**Rather than discuss *informed* critiques of astrology, Vaughan's article only addresses *misinformed* critiques as if the former did not exist.**

Fourth, debunkers could have mainly nonscientific (i.e., philosophical or metaphysical) concerns about astrological theory and its claims (see Kelly 1997, 1054–1061). But even if scientism were typical of debunkers, they could still be right about astrology. After all, human history is full of rakes, bounders, racists, and sexists, all arguably as disreputable as disciples of scientism, who have nevertheless sometimes been right about some things.

Fifth, it oversimplifies the debate over astrology by allowing only two camps, scientist versus believers, as if this dichotomy were somehow relevant. Throughout history, advocates, skeptics, and those better classified as limited believers, have embraced a great variety of divergent and overlapping philosophies, most of them irrelevant to the material claims made in astrology books.

## Conclusion

Overall, astrological readers of Vaughan's article "Debunking the Debunkers" cannot fail to get the impression that *all* criticisms of astrology are glib, misinformed, and out-of-date. Indeed, this view can be found repeated endlessly throughout astrology magazines, books, and conferences. Ironically, some of astrology's strongest critics are or have been successful astrologers themselves, and often seen as turncoats. But debunkers as defined by Vaughan are straw men, caricatures that are set up and then shown to be uninformed and dogmatic. Many are not like that, nor (if astrology delivered what the books claim) would their studies discredit it. In short, rather than discuss *informed* critiques of astrology, Vaughan's article only addresses *misinformed* critiques as if the former did not exist. The converted are thus comforted without having to reconsider their beliefs. Whatever one may think of astrology, its students deserve better than this.


## Acknowledgements

I would like to thank Geoffrey Dean, Rudolf Smit, and Jan Willem Nienhuys for their critical comments and suggestions on earlier drafts of this material.


## Notes

1. Vaughan tells her astrological readers, "During the past two decades, psychology journals have published an average of eight studies per year 'refuting' astrology" (1998, 17), as if all refutations were automatically invalid. In fact, her scare quotes seem justified but for a different reason—astrology as practiced by most astrologers is nonfalsifiable, so by definition, there can be no refuting, only 'refuting' (See Kelly 1998).

2. Many statements made in *TMA* read like relatively straightforward claims that are amenable to scientific inquiry. Consider these two statements: "Astrologers can thank the pineal gland . . . . as the physiological mechanism most likely responsible for the generalized personality traits we have come to associate with the zodiac signs" (Zagar 1998, 67); "The Sun in the same sign with Venus gives the individual great beauty. . . ." (Gomes 1998, 51), and so on, in every issue. However, things are not what they appear to be in the world of astrology. Even though claims like the latter have the outward appearance of empirical generalizations, most astrologers would consider them to be about "possibilities, potentialities, and trends . . . [where the] actual outcome depends entirely upon the client's ability to deal creatively with whatever comes" (Treberne 1998, 96). This view is representative of astrologers writing in *TMA* and other astrological journals. A further ad hoc addition is that the astrological claims do not have to be taken as literally true, but may be interpreted symbolically. For example, the sun in Taurus is connected with wealth, but this does not necessarily mean the individual is materially wealthy. The person could be spiritually wealthy or socially wealthy (have many friends, be loved by many people). These qualifications, of course, guarantee that at least one of the interpretations will fit the client, and so contribute to a successful reading.

3. An examination of issues of *TMA* from 1996 to 1999 indicates that the main methods associated with birth chart reading are intuition and psychic ability (the 'eye of contemplation') and appeals to one's own authority ('it works'). But these introduce new complications, and astrologers have not provided good reason to believe these promote agreement among astrologers. Furthermore, as used by astrologers, these terms are used in a way that is different than everyday usage. Instead of *intuition* as hunch, intuition is viewed as a leap of insight that "has resonance with the unseen universe" (Russ 1998, 93). Similarly, the usage of the term *psychic ability* is far more problematic than how most parapsychologists use the term. For example, many astrologers use the expression as an ability that "makes some kind of connections to a higher dimension of energy . . . which [enables astrologers] to see one of a client's significant past lives . . . even psychic visions of the future" (April 1998, 94). The assumption is that this unseen spiritual reality is both straightforwardly apprehended and untainted. Any issue of *TMA* and other astrological publications will attest to the pervasiveness of such scandalously underclothed views in astrology, along with little or no awareness of the intractable nature of such claims. For a discussion of intuition and ESP in the astrological context see Dean, Loptson, and Kelly (1996).

4. One might think from the way astrologers talk that they must have extracted their judgments about isolated factors from knowledge that was acquired through research. In any case, when doing research over many horoscopes, isolated factors should "shine through." For example, it would, in principle, be easy to take one thousand people with Mars conjunct their Ascendants, and then test them for aggressiveness, and next take one thousand aggressive people and see how many of them have Mars on the Ascendant compared to another thousand nonaggressive individuals (Kelly 1997, 1038). According to most astrologers, this knowledge has been acquired over centuries of astrological practice. But if the experience-based observations of the phrenologists were wrong, why not also those of the astrologers? (Dean 1998). The astrologer Cornelius says, "If astrology is not founded in objective-empirical factors observed in large populations, then what is it founded in? And what sort of truth is it that we discover in each unique case of interpretation?" (1994, 15). Unfortunately, he doesn't answer these questions.

5. Vaughan tells us, "The fact that debunkers continue to use newspaper horoscope columns as targets is obvious evidence of their faulty understanding of astrology, for no serious astrologer considers these columns a valid expression of his or her art" (1998, 15). But if Vaughan's own article condemns isolated factors like sun signs, why cannot debunkers do the same? Vaughan's statement is also false. Any discussion of sun sign columns in many astrological magazines (e.g., *Dell Horoscope*) and astrologers' Internet web pages provide ample material to contradict this claim (see quotes cited by Dean and Mather 1986). There are also plenty of serious astrologers (e.g., Nick Campion, President of the British Astrological Association) who write sun sign columns and consider

them a useful expression of their art. It is of passing interest that the same issue of *TMA* (Fall 1998) contains an article entitled "Dog*Stars of the Zodiac" (Parker 1998), where we are informed that Taurus dogs are "stubborn," that "The Aries dog likes to be first," and that Scorpio dogs are "exceedingly magnetic and charming," but only to their masters (1998, 85). As a side note: By projecting human emotions and characteristics onto animals as such astrologers do, they may be neglecting the animal's own special abilities and project certain limitations on them that trivialize them. (See for example, Budiansky [1998] for more on the topic of animal abilities.)

6. One might expect the agreement in interpreting birth charts to be much better, given the uniformity among textbooks within each school of astrology, but this applies only if they agree on what "works." A similar situation arises in psychotherapy, where a variety of different approaches can often achieve the same end. The appropriate conclusion drawn by psychologists is that the main factors responsible for successful therapy are personal characteristics of the therapist, and the quality of the relationship between client and therapist (Hubble, Duncan, and Miller 1999). The framework utilized in counseling or psychotherapy does not need to be true in order to "work." For astrologers this would mean acknowledging that accurate birth information is unnecessary for a successful reading. A useful discussion of astrology in this context can be found in Dean 1991, 1998.

7. Later she adds the observation that different astrologers routinely give different interpretations of the same client is not a problem for astrology alone. After all, "If you go to ten different doctors or therapists, you will also get ten different opinions, but it's probably cheaper to go to ten astrologers" (1998, 13). However, it is far more likely that the opinions of doctors and therapists, at least for standard cases, will concur than among astrologers. Many of the diagnostic instruments in medicine and psychology have been submitted to reliability and validity checks (see the journals *Psychoeducational Assessment*, *Psychological Assessment*, etc.). Instruments and procedures that do not fare well on these checks to the satisfaction of the scientific community are routinely criticized in the relevant literature. At least in medicine and the social sciences there is an awareness that problems of trustworthiness, validity/credibility, and the need for psychological biases to be taken into consideration. It goes without saying that the situation is hardly analogous in astrology.

8. Astrologers are in the ironic position of having to assume the reliability of science for their craft, while the converse is certainly not true. After all, astrologers utilize an astronomical ephemeris to calculate planetary positions. They also rely on the theories of astronomers regarding the outermost planets which cannot be seen with the unaided eye. Vaughan's "People born at the latitude of London are three times more likely to have Scorpio rising than Pisces rising" (1998, 14) is based on empirical observation. She tells us that astrologers are presently involved in the astrological significance of "pulsars, quasars, black holes, nebulae, infrared energy sources, radio sources, and galaxies" (p.13). Astrologers are also eager to remind their readers that many prominent scientists of the past were involved, to varying degrees, with astrology (Scofield 1998). Of course, many big-league scientists of the past were also Creationists, and many had interests in other occult areas as well (e.g., Newton and alchemy, Alfred Wallace with phrenology and spiritualism, etc.). The further irony is that while many early scientists (such as Ptolemy) and later scientists (Kepler) thought that much of astrology was amenable to scientific scrutiny, most modern astrologers are likely to dismiss scientific research as irrelevant or peripheral. For example, a survey with a prominent group of astrologers in the Netherlands found that "Most respondents think scientific research into the accuracy of astrology is senseless for diverging reasons of which none are shared by a majority" (van Assem 1993, 53). Articles in *TMA* and other astrology magazines suggest responses to the same question would be similar in other parts of the world. So while scientific findings and theories are relevant to astrological chart construction and theorizing, the same methodology is considered beside the point in investigating astrology itself.

9. The reader might examine the two introductory psychology textbooks by Myers (1998) and Wade and Tavris (1998) and compare them to any introductory book on astrology. While the psychology textbooks incorporate overviews of research, and engage the student in a critical discussion of ideas, introductions to astrology (as well as more advanced books for practicing astrologers) are devoid of a survey of the research findings on astrology, and present incompatible positions (if at all) with little or no critical evaluation.

10. The journal *Correlation* (*Journal of Research into Astrology*) was published by the Astrological Association of Great Britain under the editorships of Simon Best (1978 to 1993) and Rudolf Smit (1993 to early 1999). This journal under these editors was a model of scholarly research, publishing negative studies as well as positive studies. Healthy debate over essentials was also encouraged, to the chagrin of many of its astrologer readers.

11. It does not follow that everything can be so easily explained away. For example, the Dutch astrologer Leo Knegt (1882–1957) seems to have been able to deliver the goods, at least quite a few times, when tested under fairly rigorous (early 1930s) conditions (see Smit 1997). Modern astrologers, however, have failed to produce similar results as Knegt, with the same data (Smit 1999).

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# The Physics Behind Four Amazing Demonstrations

*Here is the physics theory behind four dramatic demonstrations—walking on broken glass, dipping one's fingers in molten lead, breaking a concrete block over someone lying between beds of nails, and picking up an orange-hot piece of silica tile.*

DAVID G. WILLEY

I have long been a firm believer that to teach anything effectively, you have to first get the audience's attention and, preferably, their interest. This belief stems from a personal experience I had early in my physics career. For the first year that I studied physics, at an English grammar school, my teacher regularly stood up in front of the class and talked to, or rather *at*, the students for about fifty minutes, nonstop. I soon got very bored with this class, coming close to failing it. The next year, because of a move brought on by a change in my father's career, I attended a different school. My new physics teacher made liberal use of demonstrations when he taught, often with a dramatic flair. This got our attention. This made physics fun, exciting, and real to us. We could see

what it was being applied to. I've been interested in physics ever since, and especially in dramatic demonstrations. In this article I describe the physics behind four of the more dramatic demonstrations that I now do on occasion for my physics classes: walking on a bed of broken glass, having a concrete block broken on me while lying sandwiched between two beds of nails, dipping my fingers in molten lead, and picking up an orange-hot piece of space shuttle tile.

## Walking on Broken Glass

For this demonstration the glass bottles should first be soaked in water to remove any paper labels. An alternative is to use Mason jars. It is best to use fairly large bottles so that the pieces formed will have only a gentle curve to them. When breaking the bottles I place them in a canvas sack and use a hammer, being sure to wear gloves and eye protection. The glass should be broken into fairly small pieces. The bed for the glass may be made from half-inch-thick plywood framed by pieces of 2"×4" wood. Once the glass has been poured into the bed it should be spread out to a uniform depth. Any piece that has a right-angled bend in it, where the sidewall of the bottle meets the base, is moved to the edges of the bed so that only relatively flat pieces of glass are included in the center of the bed where the walking takes place. As an extra precaution, I cover the glass with a cloth and then use a large cast iron skillet to pound the surface firmly. This ensures no points of glass are sticking up. This is usually done before the audience enters the room. A bed of glass about 8 cm (three inches) deep seems best, as this provides sufficient depth for the glass to be able to shift and settle somewhat as a foot is planted slowly and directly down upon it. When done this way the pieces of glass lay fairly flat and no edge presses perpendicularly against the sole. The bottom of the foot has some give to it and conforms to the shallow curve of the glass pieces. This is similar to a sharp knife being pressed with the flat of the blade against one's flesh, where considerable force may be used without injury. When walking I place each foot slowly, moving it elsewhere if a point or edge is felt, although that is seldom necessary if the bed has been prepared correctly. Care must be taken to brush off any pieces of glass that stick to the bottom of the feet when stepping off the bed.

To show that the edges of the glass are sharp I use a piece from the bed to cut the string suspending a bowling ball about a half meter (two feet) above the floor.

David Willey breaking a concrete block over Jay Leno on *The Tonight Show*. (All photos by the author)

## Dipping Fingers in Molten Lead

Dipping one's fingers in molten lead is usually cited as being an example of the Leidenfrost effect in action. However, it is not quite the same situation as when a drop of water is lifted up and hence somewhat insulated from a very hot skillet by the steam formed beneath it. Before dipping one's fingers in molten lead, the hand is dipped in a bowl of water. Then the drops are shaken off and the hand dipped quickly in and out of the lead. I usually dip the first seven or eight centimeters of my fingers. Heat from the lead goes into evaporating the water and hence not into burning the hand, and the resulting steam layer insulates the hand.

If we suppose that the fingers of one hand have a total surface area of about 100 square cm, then a layer of water 0.1 mm thick would require 2600 J of heat to warm it from 20°C to 100°C and then to boil it at 100°C. This would mean that even if the lead were to cool by 200°C, the amount cooled would need to be 100 grams, which would entail a layer almost a millimeter in thickness. The specific heat of lead is relatively small when compared to the specific heat—and more importantly the *latent* heat—of water.

It is very important when doing this demonstration that the lead be heated well above its melting point of 327.5°C. Having lead solidify on one's fingers is not pleasant. When the molten lead is hot enough, about 200°C hotter than its melting point, a gold-colored film will form on its surface. It is a good idea to have well-trimmed fingernails so that no lead gets beneath them, although I have seen the demonstration done twice by women with long painted fingernails, apparently without damage or injury. Should the lead contain impurities, or for other reasons form a dross on the surface, this should be cleaned off using a spoon fastened to a wooden handle. I find that the density of the lead makes a stronger impression on those who perform this demonstration than its temperature. Remember that lead should only be melted where there is adequate ventilation.

## Bed of Nails and Breaking a Concrete Block

Having a concrete block broken on your chest while lying sandwiched between two beds of nails usually elicits three different

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questions: Why one can lie on the bed of nails, what happens to the kinetic energy of the hammer, and what happens to the momentum of the hammer? The reason that one can lie on the bed of nails has to do with the difference between force and pressure. The nails are spaced about two centimeters apart, and hence when I lie flat a sufficient number of them support me such that no one nail has to press on my body particularly hard. I would estimate that for the bed of nails I use, made from a thousand nails, at least 150 nails support my 150 lb. weight. So even if my weight is not quite evenly distributed, no nail pushes on me with much more than 2.5 lbs. of force and that is not uncomfortable. The bed I use is made from aluminum gutter spikes, and as purchased the points of these are somewhat blunted. This is done by the manufacturer so that the spikes will not split a wooden board if driven into one. This does make for a more comfortable bed than if sharper steel nails are used. Particular care needs to be taken when getting on and off the bed, and I have seen side rails added to a bed to aid in this procedure.

David Willey dipping his fingers into molten lead.

David Willey walking on broken glass.

When the concrete block is broken, the kinetic energy of the sledgehammer goes into causing the block's destruction, ultimately warming the pieces, and the momentum of the hammer is passed through the prone person to the earth. The person swinging the sledge hammer needs to hit the block with sufficient force to shatter it, but not so hard that the hammer has a significant amount of energy left after the initial impact. It is quite possible for an adult to hit the block too hard, as I found out when an enthusiastic and strong gym teacher hit a block as hard as he could. All the breath was knocked from me and I had a matrix of puncture wounds on my chest and back. A tetanus shot saw me fine that day, and since then only my wife breaks the block. She practiced just breaking blocks on the ground many times before breaking them on me. Three-section blocks should be placed lengthwise on the top board whereas two-section blocks are best stood on end. I prefer two- section blocks as they shatter nicely.

The small pieces fly with force and must be guarded against. Also, the end pieces of the concrete block do tend to fall off the top bed of nails. Hence it is advisable to wear a face mask as well as safety goggles, hold your forearms over your face, and have other protection, such as a board placed over any other exposed areas.

### Picking Up a Piece of Orange-hot Space Tile

The hot tile demonstration illustrates the difference between temperature and heat. Small sample pieces of tile from the space shuttle are occasionally obtainable from the Lockheed Missiles and Space Company. If such a piece is heated using a Bunsen burner or propane torch until it is orange hot (about 1,000°C), it may be picked up by the edges a few seconds after the heat source is removed.

Several factors contribute to why this may be done. The basic raw material for the tile is 99.7% pure silica, which has low heat capacity and an extremely small thermal conductivity (approximately 5 J/cm.hr.°C.) Holding the tile by the edges puts the fingers in contact with the part of the tile that has cooled the most in the few seconds since the tile was heated. It also provides only a small area of contact, which can be changed if the tile is to be held for more than a few seconds.

An analogy may be made between heat flowing from the tile and water flowing from a hose pipe. Although the temperature difference between the tile and the hand, analogous to the pressure difference between inside and outside the hose, may be large, if the cross section of the hose is very small, analogous to the very small thermal conductivity of the tile, then the rate of water flow from the hose, analogous to the flow of heat from the tile to the hand, will still only be small. A small piece of tile seen from close up works best, as it is very difficult to heat a large piece uniformly unless the heating is done in an oven capable of temperatures in excess of 1,000°C. If a suitable oven, such as a ceramics kiln, is available, a dramatic photograph may be taken of a person holding a piece of the tile in a darkened room, the only illumination for the picture being the tile's incandescence. The dead layer of skin on the fingertips is generally fairly thick, on the order of half a millimeter or so, and is also a poor heat conductor. Many of the same principles apply to someone firewalking, where the feet, ash, and coals are poor conductors and the time of contact is short.

These demonstrations can be dangerous; do not try them at home. If due care is exercised, however, each is relatively harmless and guaranteed to grab attention. □

# Another Lunar Effect Put to Rest

*Thirty years ago, published reports suggested that plants could grow better on lunar "soil" than they could on terrestrial soils. A series of experimental errors, reporting errors, and omissions led to this conclusion. Previously unpublished data easily explain the reported effects.*

HAVEN SWEET

This article is long overdue. It has been written in my mind hundreds of times, only to be displaced by more pressing activities. I eventually convinced myself that people had forgotten the claims made after man first landed on the Moon, claims that attributed very unusual properties to the Moon.

My complacency changed while listening to one of the many twenty-fifth anniversary tributes to the first lunar landing. (Now the thirtieth anniversary has passed, in July 1999, and I can wait no longer.) I heard a former NASA official refer to the quarantine testing and indicate that there was one significant result: that plants had been shown to grow better on Moon dust than they did on Earth soil.

This statement thrust me back to my days with the space program, a time when similar statements were made with little regard for the facts. At that time, the press was hungry for news. The excitement of the lunar landing still held the public interest in everything dealing with space. The spotlight was on NASA, and some used this opportunity to present speculation as fact, speculation that might partially justify the mission to the Moon. Reporters sought people who would give the best quotes, and these statements were often published without question.

At that time, I was intimately involved with the Lunar Quarantine, a program established to determine if lunar soil might be harmful to Earth organisms. I was responsible for testing the lunar material on plants and helped develop many of the experimental procedures used during the first few lunar sample returns.

Plants fare OK in lunar soil
Moon Dust Acting As Fertilizer on Plants
Moon Dust Treatment Makes Plants Thrive
Plants Amaze Scientists Growing in Moon Soil
Moon Dust Is Nutrient To Plants
Figure 1. A sampling of headlines touting lunar soil.

In addition, I was responsible for data collection and analysis during the early missions. It was here that the problems began. Although the experiments yielded results that were fairly unambiguous, they were reinterpreted to imply much greater significance than was warranted. It was frustrating to watch as unfounded statements to the press were eventually incorporated in a manuscript published in the respected scientific publication *Bioscience.*

Thus, I am obliged to set the record straight concerning those aspects of which I have first-hand knowledge. I think readers of the SKEPTICAL INQUIRER will appreciate seeing how a combination of errors, some misrepresentation, and a large dose of wishful thinking resulted in these conclusions that plants grew better on lunar soil than on Earth soils.

There is danger in allowing this myth go unchallenged. The belief that the Moon possesses unusual and highly positive properties could erroneously justify return missions. In addition, some people may note the absence of further publications dealing with this "lunar effect" and conclude that some sort of conspiracy caused the silence. What is needed is a clear look at how these results came to be, and how the myth grew.

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## Background of Plant Quarantine Testing

As part of the trip to the Moon, NASA was required to determine if "lunar organisms" existed, and if so, whether they posed a threat to Earth. Although we now recognize the Moon as a very inhospitable place for life, before the first landing, some people feared that life might exist in sequestered locations. The lunar quarantine provided time to evaluate whether such organisms existed, and whether they could infect plants or animals.

Introduction of organisms into new environments has resulted in countless environmental disasters; chestnut blight, Dutch elm disease, and the fatal spread of European diseases among American natives are but a few examples. Thus, the lunar material was contained in isolation chambers while being tested on plants and animals. The test organisms were then monitored for signs of infection by putative lunar pathogens.

Realizing there was little chance of alien life forms on the Moon, our botanical group decided to also determine if lunar material could be used for plant growth. Since any lunar settlements would grow plants for food and oxygen, it was important to know if the abundant lunar dust could physically support, or provide some nutritional benefit to, the plants. Not having to ship plant nutrients from Earth would provide significant savings.

## Testing Procedures

The plant experiments involved testing thirty-one species, which were exposed either as actively growing plants, seedlings that had just germinated, intact plants grown on artificial media, or isolated tissues on artificial media. Some species were given normal fertilizers, while others received only a few of the required nutrients. Because of the lack of nutrients, it might be possible to determine if the plants "mine" the necessary elements from the lunar material, just as is done in Earth soils.

In almost every case, plants were given one of four different treatments:

1) exposure directly to lunar material (this was the experimental treatment)

2) exposure to lunar material that had been heat-sterilized (to serve as a control for the possibility of a toxic lunar element)

3) exposure to a sterilized sample of pulverized Earth rock that simulated the lunar soil (to control for effects caused by small particles)

4) unexposed plants (as a general control)

The amount of material exposed to each plant was typically very small, being only a maximum of 0.22 grams per plant or culture. For comparison, this is the amount of material that would fit in bottom half of a 22 mm bullet casing (in fact, this was the dispensing scoop).

To prevent escape of any putative lunar organisms to the outside world, all experiments were performed in sealed, gas-tight cabinets. The amount of space available to perform experiments was minimal, the number of replicate samples was far below what was needed for statistical significance, the ability to manipulate the plants was very limited, and measurements had to be made remotely through the cabinet windows. In addition, none of the plant materials could be sacrificed during the experiment, prohibiting tissue removal, chemical extraction, or dry-weight measurements.

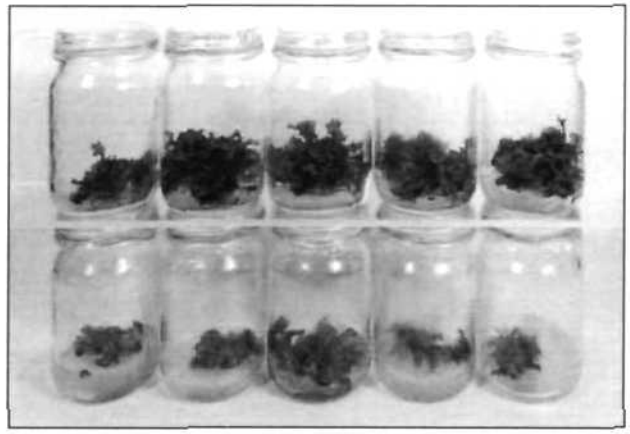

Figure 2. Liverwort cultures. Those on the top were exposed to lunar material while the bottom cultures were untreated. (originally published in *Bioscience*, vol. 20, #24, p. 1301. ©1970 American Institute of Biological Sciences)

## Headlines

During the lunar missions, mission control in Houston was the focus of most news reporters, although the astronauts and the moon rocks were the primary story. The quarantine, on the other hand, was of little interest since the results were negative. Eventually, however, reporters were given information implying that the lunar material was at least a fertilizer, and perhaps something more. This revelation resulted in headlines such as Plants Fare OK in Lunar Soil,[1] Moon Dust Acting as Fertilizer on Plants,[2] Moon Dust Treatment Makes Plants Thrive,[3] Healthier Plants Shoot Up From Moondust Diet,[4] and Good for Plants: Synthetic Moon Dust Fertilizer.[5]

National attention seized the program when a NASA official was quoted in *Parade* magazine as saying "the moondust plants were very clearly ahead of others in growth" and that the lunar material is "not a fertilizer but you'd have to call it some kind of growth promoter." In addition, he went on to suggest that the moondust should be chemically analyzed and then artificially reproduced for commercial uses on Earth! I will not bother to comment further on these articles except to note that some may have resulted from unskeptical reporting, while others were caused by unbridled enthusiasm of the persons being interviewed.

## Scientific Publication

The plant quarantine results appeared most prominently in *Bioscience*.[6] Unfortunately, this manuscript did nothing to correct earlier allegations that plant growth had been stimulated by the lunar material; rather, these conclusions were repeated, and incomplete or misleading data were presented to support them. A careful reading of the paper should have raised some warning flags (and did alert some of the reviewers) since there were significant omissions and discrepancies.

With this background, let us review the actual experiments, the claims based on them, and my interpretation of the same.

### Liverwort Studies—Presented Results

Perhaps the most dramatic effect of lunar material on plants appears in cultures of a primitive plant called a liverwort. The plant was grown on nutrient-containing agar in jars covered with a lid permeable to gas and light. As is readily apparent from the photograph (figure 2), the cultures exposed to lunar material (top row) were definitely larger than the untreated cultures. Indeed, one administrator kept these cultures on his desk for months after the quarantine ended and showed them to visitors to the lab.

The published text states that the liverwort, grown "on modified Knudson's solid medium, grew several times larger and exhibited an enrichment in pigmentation over untreated controls."

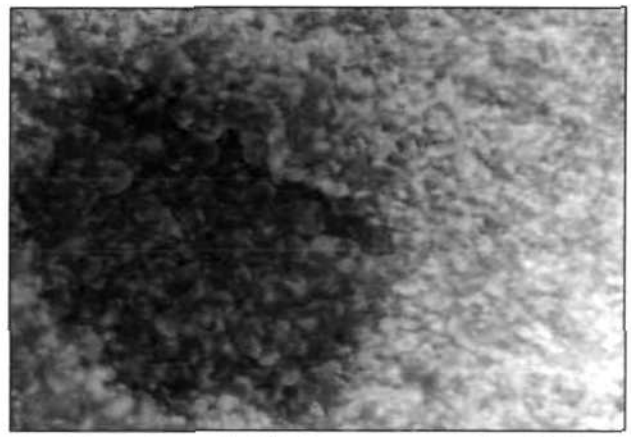

Figure 3. Gametophytes on the right side were on agar containing minimal nutrients, while those on the left grew directly on lunar material which was moistened by the agar solution. The color and size differences were very pronounced.

Although figure 2 shows five lunar-treated cultures which were substantially larger, there are several alternate explanations of these differences, and other data which cast doubt that this was an effect caused by lunar material.

### Liverwort Results—Unconsidered Factors

First, only five of the ten lunar-treated cultures were selected for display. I do not recall how selection was accomplished, but I had written in my notes that the selection was *not* random.

Second, the display ignores the other thirty cultures. Unfortunately, no data were presented to indicate whether the heat-treated lunar material also enhanced growth. This would be the expected if the lunar material stimulated growth.

Third, within the first days after inoculation, the cultures were all photographed. Later, the subjective rating of each culture's size was made from these photographs, and the larger size of lunar exposed plants was clearly present shortly after inoculation (table 1).

| Exposure | # of cultures observed to be: | | |
|---|---|---|---|
| | Larger | Average | Smaller |
| Lunar | 6 | 2 | 2 |
| Lunar heated | 2 | 2 | 6 |
| Earth heated | 3 | 0 | 7 |
| Untreated | 2 | 2 | 6 |

Table 1. The subjective evaluation of the size of liverwort cultures, made within three days after treatment with *Apollo 11* material.

These unpublished data indicate that, early in the experiment, *the cultures exposed to lunar material were larger than* average. Growth increases of this magnitude do not commonly occur among plants within 48–72 hours of treatment, unless powerful growth regulators are used. In addition, any such enhancement would not abruptly cease after a few days.

If this enhancement was a nutritional effect, all soil-treated cultures should show a benefit. However, the lunar sterilized plants were almost identical to both the terrestrial soil and the untreated controls. Considering that the lunar material baked in intense solar radiation for approximately 4 billion years, a sterilization treatment of sixteen hours at 150° C is unlikely to alter the properties of the sample.

### Liverwort Studies—The Explanation

What caused these results? An error occurred during experimentation! Prior to the mission, all containers were maintained in the isolation cabinets. Since some cultures grew poorly or developed infections, they were constantly evaluated and the unhealthy specimens replaced by new cultures. To facilitate this process, the cultures were arranged according to their overall size and health; the most vigorous on the top left, and the weakest on the bottom right. The worst cultures could then be quickly removed and fresh ones inserted in the appropriate hierarchy at any time prior to the start of the experiment.

The technician performing this experiment was instructed to randomize the cultures prior to inoculation. However in his excitement at handling the lunar soil, he forgot. The first cultures exposed were the healthiest, and they all received the lunar material. The progressively smaller ones received sterilized lunar, then sterilized earth and finally, the last cultures were untreated. This explains the size differences, which were noted almost from the start.

Even though the explanation for the apparent growth stimulation was in hand, the photograph of selected culture vials was still widely disseminated as evidence of the stimulatory effects of lunar material.

Furthermore, a repetition of the experiment during the second lunar landing quarantine (this time, properly randomized at the start) showed no such enhancement of growth (table 2). These unpublished data were available at the time the *Bioscience* manuscript was being prepared, but were not included.

### Seedling Elongation—Presented Results

Seed germination studies were cited as yielding another, apparently stimulatory, effect. In these experiments, 100 seeds of each species were placed on a nutrient-free cellulose medium and exposed to one of each of the four treatments.

The results published in *Bioscience* showed the average seedling height fifteen days after they were inoculated and allowed to germinate.

| Exposure | # of cultures observed to be: | | |
|---|---|---|---|
| | Larger | Average | Smaller |
| *Lunar* | *2* | *0* | *8* |
| Lunar heated | 2 | 6 | 2 |
| Earth heated | 2 | 3 | 4 |
| Untreated | 3 | 4 | 2 |

Table 2. The subjective evaluation of liverworts, 32 days after initial treatment with *Apollo 12* material.

### Seedling Elongation—The Explanation

From table 3, it appears that, at least in the case of lettuce, there is an enhancement of the seedling elongation, although none of the differences are statistically significant. The publication notes that the height "was slightly higher in lunar material for three of the four species measured," although it neglects to mention the lack of statistical significance of this finding.

The perceptive reader, however, will notice that a control is omitted from the table; plants exposed to Earth heated material. This was an unfortunate omission, as can be seen from the unpublished data in table 4. It is apparent that the Earth soil provided the greatest enhancement effect in all but the radish.

Thus, while the lunar-exposed seedlings may have appeared longer when compared to nutrient-deprived seedlings (possibly a nutritional effect, most likely just normal variation caused by sampling), they were not as tall as plants grown on pulverized terrestrial rocks.

### Fern Spore Growth—Presented Results

After fern spores germinate, they develop into flattened, heart-shaped structures called gametophytes. According to the results section of the paper, "gametophytes developing in contact with lunar materials grew. . . . approximately three times larger than plants not contacting the material." Unfortunately, the microscopic size of the ferns, the way they were cultured, and the requirement that they not be disturbed, made it impossible to obtain quantitative data. However, when visually compared to spores which grew only on agar, all cultures showed a dramatic

increase in size and greening when on, or directly adjacent to, any of the rock material. This growth enhancement appears to represent a significant finding (figure 3).

Since ferns are an early pioneer species (one of the first to colonize barren rocks after volcanic eruptions or other catastrophic events), it would be logical to assume that the enhancement was the result of a nutritional effect. That is, the plants "mined" the rock particles to provide chemical elements which are missing in the rest of the media.

Spores are only a single cell and, unlike seeds, do not have a large reserve of nutrients to sustain them during the first few weeks of life. Plants need at least seventeen different elements as nutrients; some are required in large quantities, while others are needed only in trace amounts. If an element is lacking, the result is poor growth, abnormal development, or death.

According to the *Bioscience* article, nutritional supplementation by the soil could not be the explanation since "every attempt was made to provide each species with optimum levels of major and minor elements."

### Fern Spores—The Explanation

Contrary to the above statement, the growth media did not provide any of the minor elements. The ferns were grown on Knops solution, which contains only seven of the seventeen required elements normally provided by soils. This would be like providing a human with protein, fats, and carbohydrates, but no vitamins or minerals.

Thus, it is understandable that spores grew better on pulverized rock than on the nutrient-poor agar. Although not stated, the ferns growing on terrestrial soils also exhibited enhanced growth. Although their color initially lagged behind that of the plants on lunar material, after two months of growth the Earth-treated plants developed the coloration of the lunar-treated plants.

The astute reader may notice that the results presented in table 5 of the *Bioscience* paper are incomplete. The lunar-heated treatment of *Onoclea sensibilis* is missing. However, in this case the explanation is mundane; there were no data because the treatment had been omitted for this species.

### Tissue Culture Growth—Reported Results

Nine different species of plants were raised as tissue cultures and exposed to the soils. Small pieces of plants were provided with nutrients and hormones in an agar substrate. The plant cells would typically grow as a mass of tissue within the enclosing jar.

It is interesting to see how the results of these experiments were interpreted in the article's discussion section. In the results section of the paper, the only reference to the tissue cultures is that localized necrosis (dying) "was observed following challenge with either terrestrial or lunar material. This reaction did not persist and was followed by an increased growth and pigmentation after 2 weeks." No data were presented, but the statement implies that both terrestrial and lunar treatments responded similarly.

| Exposure | Height of seedlings | | | |
|---|---|---|---|---|
| | Cabbage | Lettuce | Radish | Spinach |
| Lunar | 18.3 | 19.4 | 22.5 | 22.3 |
| Lunar heated | 16.9 | 19.7 | 24.8 | 24.8 |
| Untreated | 16.7 | 16.0 | 24.2 | 21.7 |

Table 3. Height (mm) of seedlings 15 days after germination in the presence of *Apollo 11* lunar material.

In the discussion section, these results were at first summarized as "certain tissue cultures dusted with a thin layer of lunar material benefited by this treatment." Then the discussion became even bolder by saying that "the addition of lunar material. . . . caused marked increase in growth of these cultures." This eventually led to the speculation that tobacco tissue cultures were secreting acids that dissolve the lunar material. Not bad for a necrotic reaction!

| Exposure | Height of seedlings | | | |
|---|---|---|---|---|
| | Cabbage | Lettuce | Radish | Spinach |
| Lunar | 18.3 | 19.4 | 22.5 | 22.3 |
| Lunar heated | 16.9 | 19.7 | 24.8 | 24.8 |
| Earth heated | 23.2 | 31.3 | 21.8 | 29.2 |
| Untreated | 16.7 | 16.0 | 24.2 | 21.7 |

Table 4. Same as Table 3, but with the missing data included.

### Tissue Culture Growth—Actual Data

The omission of any of the data for tissue cultures is interesting since there were subjective evaluations of the cultures available. Nineteen days after exposure to the materials, the cell masses were subjectively rated from 1 to 12, based on their overall health and vigor (pigmentation, texture, lack of necrosis and growth). These previously unpublished data (table 5) show, even without statistical analysis, that there was no stimulatory effect of the soils. In fact, it is apparent that *all* the cultures declined during the experiment (an expected result since the cultures were not provided with fresh media), and that the untreated cultures had the highest score.

| Exposure | Subjective Score (1-12) | |
|---|---|---|
| | Day 2 | Day 19 |
| Lunar | 10.9 | 7.9 |
| Lunar heated | 11.4 | 7.9 |
| Earth heated | 11.6 | 7.2 |
| Untreated | 11.5 | 8.9 |

Table 5. Average of 10 replicates each of 7 species maintained in tissue culture. *Apollo 11* data.

## Summary

I have limited my observations to that research which I personally observed or participated in, and for which the original data still exist. I am not disputing later, more carefully reported experiments which pursued some of these early findings.

When data are omitted from a manuscript, readers tend to assume the author omitted insignificant information to conserve space. However, this is not always the case. The history of science is filled with examples of wishful thinking that led to unsupported conclusions: canals on Mars, polywater, and cold fusion are just a few.

In most scientific study, subsequent repetitions of experiments by other researchers uncover the truth, and the incorrect conclusions are relegated to a footnote. The quarantine testing, however, was one of a kind. It is unfortunate that the interpretation of the results has added to the mythology surrounding the Moon.

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# Gould's Separate 'Magisteria': Two Views

*We present two independent and contrasting reviews of Stephen Jay Gould's latest book* Rocks of Ages. *—The Editor*

*Rocks of Ages: Science and Religion in the Fullness of Life.* By Stephen Jay Gould. The Library of Contemporary Thought. The Ballantine Publishing Group, New York, 1999. ISBN: 0-345-430009-3. 241 pp., Hardback, $18.95.

> *This book rests on a basic, uncomplicated premise that sets my table of contents and order of procedure, and that requires restatement at several points in the logic of my argument: NOMA is a simple, humane, rational, and altogether conventional argument for mutual respect, based on non-overlapping subject matter, between two components of wisdom in a full human life: our drive to understand the factual character of nature (the magisterium of science), and our need to define meaning in our lives and a moral basis for our actions (the magisterium of religion).*
>
> —Stephen Jay Gould, *Rocks of Ages*

## MARK W. DURM

The quotation in the inset is an excellent description of this fascinating book by Stephen Jay Gould. Gould proposes "an eminently sensible solution to the nonproblem of supposed conflict between science and religion." I think not only that all scientists and religious leaders should read it but also lay people, school teachers, Sunday school teachers, and counselors to name just a few. Gould writes that even though his "sensible solution" is supported by most major thinkers in both science and religion, it is usually resisted and poorly comprehended. Gould, in his lucid and lively manner, explains why.

To begin with, Gould believes this supposed conflict exists in people's minds and social practices, not in the logic or functioning of these "entirely different, and, equally vital, subjects." He proffers that people of good will want to see religion and science at peace together and for both to enrich, enliven,

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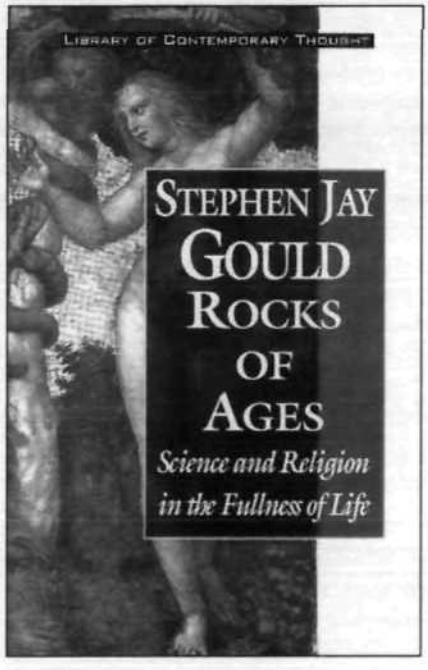
*Mark Durm is a professor of psychology at Athens State University, Athens, Alabama.*




## MASSIMO PIGLIUCCI

Let me make two things clear at the outset, before I get accused of being a Gould-basher or a rabid atheist. I am neither. Stephen J. Gould is a colleague whom I admire, agree with, disagree with, and who sometimes just overdoes it. An atheist I am, but not a rabid one. I don't wish to start holy wars against religion and I have an active distaste only for the fundamentalist-in-your-face-I-have-to-legislate-your-life kind. However, that does not mean that I will refrain from engaging in a frank discussion of the topic.

Gould's latest book, *Rocks of Ages*, is extremely disappointing. Simply put, and with the exception of one chapter to which I will later return, it's a badly written, condescending, and misleading book. That *Rocks of Ages* is badly written is recognizable by many symptoms, chief among them are the numerous parenthetical statements that take several

*Continued on page 55*

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and enhance people's existence. Gould offers the analogy of the human body that requires both food and sleep, "the proper care of any whole must call upon disparate contributions from independent parts."

The proper care of the whole is NOMA, or Non-Overlapping Magisteria. Gould carefully explains that the term *magisteria* is *not* akin to *majesty* or *majestic* but instead is defined as a "domain where one form of teaching holds appropriate tools for meaningful discourse and resolution." That is, people debate and exchange dialogue under a magisterium. Even though the magisteria of science and religion do not overlap, even though one studies the age of rocks while the other proclaims the rock of ages, even though one pursues knowledge of how the heavens go while the other of how to go to heaven (paraphrasing Gould here); both can be independent, can be NOMA, and yet still contribute to the essence of life of the whole person. Is not the whole worth more than the sum of its parts?

In the first section titled "The Problem Stated," Gould passionately writes of Charles Darwin and presents a picture of this man that few know. He writes of Darwin's despair at the death of his young daughter Annie. And even though he permanently lost a personal belief in a caring God, he did not become hostile toward religion nor did he try to impose his belief upon others. Why? Because Gould argues that Darwin "understood the difference between factual questions with universal answers under the magisterium of science [as compared to] moral issues that each person must resolve for himself." That is, the magisteria do not overlap, the "causes of life's history could not resolve the riddles of life's meaning." Darwin knew this, accepted it, and went on to live a happy life.

In the second section, "The Problem Resolved in Principle," Gould defines and defends NOMA. He writes that since the two realms of science and religion cannot fuse, each of us must integrate them into a coherent view of life with the result of something "more precious than rubies"—wisdom. This integration into a coherent whole requires equal status for each, but the religion described here need not be formal, but may instead be a magisterium of moral ethics and meaning.

Further in chapter two, Gould summarizes the first commandment for NOMA: "Thou shalt not mix the magisteria by claiming that God directly ordains important events in the history of nature by special interference knowable only through revelation and not accessible to science"—that is, a miracle. Writes Gould:

> NOMA is no wimpish, wallpapering, superficial device . . . NOMA is a proper and principled solution—based on sound philosophy. . . . NOMA is tough-minded. NOMA forces dialogue and respectful discourse about different primary commitments. NOMA does not say "I'm OK, you're OK—so let's just avoid any talk about science and religion."

Section three describes "Historical Reasons for Conflict" and its content is enlightening. Gould documents that prior to Columbus most scholars, even Christian scholars, believed that Earth was round. Why then the flat Earth problem? Well, according to Gould, there was not a flat Earth problem prior to 1870 in America, but after 1880 almost all history texts featured the problem! It was this time, roughly between 1870 to 1880, that warfare between science and religion started in America and became a guiding theme for Western history. That is, science was gaining and religion (particularly Catholicism) was retreating. According to Gould, two nineteenth-century authors, John William Draper and Andrew Dickson White, started the war—Draper with his *History of the Conflict Between Religion and Science* published in 1874 and White with his 1896 publication *A History of the Warfare of Science with Theology in Christendom.* Draper's text was strongly anti-Catholic, anti-Rome. What better way, thought Draper, to weaken the Vatican's hold than to say the Catholic church believed in a flat world, and science had proved them wrong.

A more recent historic struggle for NOMA is modern creationism. Creationism provides an "example of the principle that all apparent struggles between science and religion really arise from violations of NOMA, when a small group allied to one magisterium tries to impose its irrelevant and illegitimate will upon the other's domain." This affront to NOMA is, however, purely American. Gould reveals that in most parts of the world the belief in evolution and the belief in religion do not preclude each other. Furthermore, even in America, "creation science" has only come to the forefront in the latter half of the twentieth-century. For example, Gould's own high school textbook, *Modern Biology*, published in 1956, had as its frontispiece a picture of a bunch of beavers. The 1921 edition of the same text had Charles Darwin as its frontispiece.

The last section is titled "Psychological Reasons for Conflict," and examines mankind's longing for a caretaker, for an explainer, for reason. Gould writes ". . . we live in a vale of tears, and we therefore clutch at any proffered comfort of an encompassing sort, however dubious the logic and however contrary the evidence."

People strive for a God that provides warm, fuzzy feelings but, Gould explains, mankind may have to settle for a cold bath. Where is the warm feeling for the ichneumonid wasp that paralyzes a caterpillar, injects her eggs inside it, and whose larvae from the hatched eggs slowly eat the living, paralyzed caterpillar from the inside? Where is the warm feeling for children who die needlessly? Gould responds that nature is not immoral, it is amoral; it's better to be in a cold bath than no bath at all.

Gould concludes by discussing two

false paths to *irenics* (irenic comes from the Greek word for "peace"). Gould firmly believes that two current attempts at bridging science and religion are misfits. The first is the *syncratic* school of thought, that science and religion can fuse as one big, happy family. The syncratic school believes the findings of science support and "validate the precepts of religion, and where God shows his hand (and mind) in the workings of nature." Gould believes the syncratic path will eventually lead to the same country where the Sun revolves around the Earth.

The second false irenic path is the "politically correct" one, that is, conflict will never generate between science and religion because the two should not talk to each other. Gould admits there can be no conflict where there is no discussion—but then, nothing is ever resolved either!

In ending, it is Gould's hope that all people of good will, who hold science, religion, or both, dear will recognize the logically sound, humanely sensible, and civil manner of NOMA. He writes in the last paragraph of the book:

> The non-overlapping magisteria of science and religion must greet each other with respect and interest on the most distinctively human field of talk. To close with a rationale from each magisterium, scientists generally argue that language represents the most special and transforming feature of human distinctiveness—and only a dolt would fail to lead with his best weapon. As for religion, this book began with [a story from] John's gospel. . . . I do know, of course, that the phrase bears another meaning in its original context, but John also acknowledged the same precious uniqueness—the key to resolving our conflicts, and the positive force behind NOMA—in starting his gospel with a true guide to salvation: In the beginning was the Word.

*MASSIMO PIGLIUCCI*

*from page 53*

sentences, in many cases starting in the middle of a page and continuing all the way into the following one (e.g., pp. 7–8), and the equally obnoxiously long footnotes (e.g., p. 55–57). As if that were not enough, two sections of the book are reprints not from previously published essays, but from previously published *chapters* of books that were in turn collections of essays! As for condescension, I cannot find another word to describe an atheist who keeps using the locution "Lord knows" (e.g., p. 163) or uses self-effacing sentences like "I present nothing original . . . while perhaps claiming some inventiveness in choice of illustrations" (p. 3).

But the misleading argument central to the book represents the real problem. It is that science and religion are not in conflict, and the reason is purported to be NOMA, or Non-Overlapping Magisteria. This is an old idea that Gould has repackaged with a fancy label. It basically says that "Science covers the empirical realm . . . religion extends over questions of ultimate meaning and moral value" (p. 6). Since the two areas of inquiry are so neatly separated, argues Gould, why all the fuss about a "supposed conflict" (p. 3)?

Well, for one thing, because such conflict can be traced throughout the history of science, including burning at the stake scores of "heretics" whose empirical findings or philosophical theories trod on ground already claimed by religious dogma. But Gould seems to be reading history in a very original way. For example, he thinks that Galileo is really to blame for his misfortunes, because he was not politically savvy enough to know how much he could push Pope Urban VII (pp. 71–74). Gould calls this "one defining historical accident," as if it were an exception to an otherwise reasonable history of conduct on the part of the Catholic Church. Assuming that Galileo did miscalculate his own influence on the religious authorities, this is an argument in favor of scientists hiring lobbyists and lawyers, not a gem in science-religion relationships.

One of Gould's reasons for supporting NOMA is his uncritical application of Aristotle's "golden mean." The idea, of course, is that *sometimes* the truth can be found in the middle between two extreme views. Gould calls as his witness the English essayist G.K. Chesterton, well known for such nonsensical phrases as "art is limitation; the essence of every picture is the frame" (I wonder what would happen if suddenly art museums would decide to overcome their limitations, hang frames, and get rid of pictures). While I have a hard time following Gould's logic here and seeing the connection with the science-religion debate, sometimes (as Richard Dawkins recently remarked) the truth simply cannot be found in the middle. While the golden mean surely appeals to contemporary political correctness, Gould himself repeatedly opposes such Solomonic solutions in the case of creationism: he certainly does not want creationism and evolution taught side by side in public schools (pp. 123–150).

One of Gould's most maddening logical fallacies in this book is the recurrent citation of individual scientists who espoused one version or another of NOMA. Chief among them, of course, was Charles Darwin (pp. 191–207). In a famous passage concerning the perceived atheistic implications of natural selection he wrote: "I feel most deeply that the whole subject is too profound for the human intellect. A dog might as well speculate on the mind of Newton." Perhaps this is a great example of Darwin's humility (perhaps not, since the historical record clearly shows that he was much more canny and politically savvy than most people think—see E. Caudill, *Darwinian Myths*, 1997). Regardless, it is equally easy to round up very respectable scientists who dare to make a direct connection between science and unbelief (about 95 percent of the "great scientists" interviewed in a 1998 survey—see E. J. Larson and L. Witham, Leading scientists

still reject God, *Nature* 394:313—and also their article in the September 1999 *Scientific American*). The logical validity of a position simply cannot be decided by majority rule, which—once again—is exactly why we don't teach creationism in American public schools.

There are several intrinsic reasons why NOMA does not hold water. First, it is not true that (most) religions do not make claims about the natural world. Besides the tens of millions of people who believe the Earth is 6,000 years old, the Bible was never *meant* as a book of metaphors. It is read that way by enlightened Christians today precisely because of the long battle between science and religion, with the latter constantly on the losing side. Second, it is not true that religion is the only, or even a viable, quest for ethics. In fact, it is not a quest at all, since it is based on arbitrary sets of rules and on the enforcement of dogmas. Philosophy, using the tools of logic and informed by the discoveries of science, seems to me a much better candidate for that magisterium.

Perhaps the only valuable part of the book is the very last section of the last chapter, where Gould convincingly demolishes other attempts to reconcile science and religion. He calls these "the syncretic school," referring to the idea that science and religion actually describe the same unified reality and will eventually converge toward one grand unified theory of knowledge. The Templeton Foundation is a generous source of funding for science-religion syncretism (their prize for the advancement of religion is more hefty than the Nobel). Gould lashes out at the Foundation for sponsoring conferences in which all sorts of bizarre arguments are used to achieve the ultimate science-religion fusion. For example, physicist F. Russell Stannard suggested that the "mystery" of the dual nature of Jesus (human and divine) can be "understood" in terms of quantum electrodynamics (QED), as equivalent to the particle-wave nature of light. The good professor conveniently neglected to specify how QED field equations could predict the Second Coming. Gould does not seem to realize that the kind of syncretism that he so effectively tears down, together with the creationist version of religion dominating science that he rightly despises even more, are exactly what the overwhelming majority of people think of when they think of religion and reality. A few sophists and intellectuals are the only ones playing with more esoteric versions of religion for which the conflict with science may be remote or nonexistent.

In the end, the major reason for a fundamental conflict between science and religion was highlighted honestly and in a straightforward manner by physicist Richard Feynman. In *The Meaning of It All* (1998), he says that it boils down to a matter of attitude. Regardless of what the goal of the inquiry is, science fosters doubt and investigation based on empirical evidence; religion, on the other hand, is based on dogma and revelation. It is hard to see how those attitudes can logically coexist in the same brain.

# Of Stories and Statistics

MARK DURM

*Once Upon A Number: The Hidden Mathematical Logic of Stories.* By John Allen Paulos. Basic Books, New York, 1998. ISBN 0465-05158-8. 214 pp., Hardback, $23.

*"An integration of stories and statistics, or more generally, of the literary and the scientific, can be energizing."*

And John Allen Paulos does just that in this educational and entertaining book—he energizes the reader to fill the gap between stories and statistics, between narratives and numbers, between tales and truth. Writes Paulos, "Describing the world may be thought of as an Olympic contest between simplifiers—scientists in general, statisticians in particular—and complicators—humanists in general, storytellers in particular. *It is a contest both should win*" [italics mine].

Paulos informs the reader in a detailed, yet sometimes humorous, manner in which both storytellers and statisticians can win in describing our world. He reminds us that when you listen to stories you want to suspend disbelief to be entertained, whereas in evaluating statistics you are inclined to suspend belief so as not to be beguiled. And yet if the gap between the two can be bridged, if people can find the hidden mathematical logic of stories, and if narratives can be added to statistics, the world would be a better understood place.

Paulos writes wittily. The reader must be on his or her proverbial toes to get the full effect of Paulos's intelligence. He writes of ordering an *extra medium* ice cream, he mentions Keillor's Woebegone Effect in which *everybody is above average*, and he describes young Shepsel, the neighborhood's perfect sharpshooter (Shepsel shoots first, and then he draws the target around the bullet hole). He discusses the "belly-shaped curve" and gives a good logical probabilistic explanation for Murphy's Law by using socks (yes, socks). Another example of Murphy's Law Paulos explains is the "waiting time paradox," how delays in supermarket lines and doctors' offices are caused by mathematical variation, not some cosmic malevolence. Furthermore, he explains how

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you can become a "psychic" to your friends by using cards. It is not a magic trick, but a mathematical trick using probabilistic coupling.

Paulos's greater contribution, however, is not in explaining how numbers can be used in a comical way but instead in a rational, logical way—a way in which statistics can add to stories. "Subjective viewpoints and objective probabilities have at times a troubled relationship that resembles that between informal discourse and formal logic," he writes. "Applications of probability and statistics require a story, a context, or an argument in order to make sense." He says applying probability and statistics is much more a matter of comprehending the situation, of creating informal arguments, and of building comprehensive narratives than of substituting numbers into formulas. For instance, he contends that no matter how accurate the statistics are on, say, affirmative action, to be truly meaningful they must be imbedded in a story that helps advance the argument. He adds further that when one understands the idea of freedom of expression, "It should not be measured by how likely the *average* person is to be silenced, but by how likely someone with something to say is."

Paulos also notes how stories can misuse statistics. He relates how the collection and distribution of social statistics affects the quantities being measured. For example, on religious surveys people tend to overestimate their activity while on sex surveys they tend to underestimate it. Other abuses: the average American adult has one testicle and one ovary, and the average resident of Dade County, Florida, is born Hispanic and dies Jewish. Paulos takes on the believers in the Bible codes by offering a humorous *Bill/Monica* code in the U.S. Constitution and a *Roswell/UFO* code in a verse in the King James version of Genesis. He writes that "common sense underscores the inanity of basing any political, spiritual, or sexual judgments on these contextless numerological oddities."

Finally, Paulos believes that if people are comfortable with the insignificance of most coincidences (the statisticians) or if they insist on always finding meaning behind the coincidences (the storytellers), it reveals much about their personality and world outlook. Both, however, should contribute since the integration of both can energize both. His concluding paragraph is worth quoting in full:

> How we can maintain a place for the individual, protected from the overweening claims of religion, society, or even science, is an increasingly important unsolved problem. Its solution, I have no doubt, will require simply and pragmatically accepting the indispensability of both stories and statistics and of their nexus, the individual who uses and is shaped by both. The gap between stories and statistics must be filled somehow by us.

# Clear Thinking About Human Cloning

TERENCE HINES

*Who's Afraid of Human Cloning?* By Gregory E. Pence. Rowman and Littlefield Publishers, Inc., Lanham, Maryland, 1998. ISBN 0-8476-8782-1 (pbk) 0-8476-8781-3 (hbk). 181 pp. Paperback $14.95, hardback $47.50.

*Who's Afraid of Human Cloning?* is the best thing I've seen written about cloning since the birth of Dolly the cloned sheep in 1997. The vast majority of post-Dolly writing on cloning, especially in the nonscientific press, has been near-hysterical fear-mongering drivel. Typically, commentators trot out the worst possible, and most unlikely, horrors that they think (hope?) might grow out of successful human cloning, such as being threatened with dozens of Hitlers (or Saddams, or whomever). Or the possibility that an army of mindless clones might be created by some ruthless warlord. Or the possibility that rich individuals might have themselves cloned, but leave out the genes for the brain, so that they would have a spare parts source.

Gregory Pence, a professor of philosophy at the University of Alabama in Birmingham, destroys such arguments against human cloning. He argues cogently that if and when human cloning becomes possible, it will represent little more than another step in reproductive technology and one that individuals should be free to choose if they desire.

Regarding the idea that a group of clones could be created from the cells of an evil ruler, Pence points out one of the most misunderstood aspects of cloning. This is the belief that a cloned individual would be genetically identical to the individual from whom the cell nucleus was obtained. To make this point clear, it is necessary to provide a bit of detail on how cloning is done. Basically, a cell (it need not be an egg) is obtained from a female and the nucleus of that cell is removed. Then a nucleus from a cell from the individual to be cloned is obtained and inserted into the enucleated cell from the female. This now nucleated cell is placed in a uterus and allowed to implant and come to term. The individual generated in this fashion will almost never be genetically identical to the individual who was

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cloned. This is because the female that donated the cell into which the nucleus is inserted will almost never be the mother of the individual who donated the cell nucleus. It is common knowledge in the biological sciences, but apparently almost totally unknown outside, that there is DNA not only in the cell nucleus, but in the cell's cytoplasm. This is known as mitochondrial DNA. Thus, a cloned individual will have the nuclear DNA of one individual, but the mitochondrial DNA of another. Mitochondrial DNA plays important roles in biological processes in the cytoplasm and in a number of serious diseases.

Only if the enucleated cell came from the nucleus donor's biological mother would the cloned individual be identical to the nucleus donor genetically. But this would certainly not mean that the cloned individual would be identical to the nucleus donor in every respect. Unless, that is, environment, both *in utero* and after birth, has absolutely no influence on any aspect of the individual's physical and behavioral development. In the case of humans, environmental influences have major effects on the more psychological aspects of an individual. Even if, as now seems likely, genetic factors can account for around half of the variance in different aspects of personality, intelligence, and the like, this means that environmental factors are responsible for the other half.

So, for Saddam, or whomever, to try to create himself over again, he'd have to get cells from his mother, try to duplicate her intrauterine environment as it was 50 or so years ago, and recreate his own childhood experiences during at least the first 15 or so years of the clones' lives, just to have a reasonable shot at turning out someone like himself. Does this sound very likely? Not at all. Like conspiracy theories that fall apart when one considers how much effort would have had to be put into the conspiracy if it were true, so worries about cloning disappear when one considers the practical side of actually *doing* the cloning.

Another excellent example is the often-expressed fear that someone like Saddam could create an army of mindless automatons. First, no one would really *want* an army of automatons. They'd make lousy soldiers, being unable to make any decisions on their own. That aside, cloned humans would still be human in every respect. Each would have their own mind, personality, fears, dreams, and so on. Even if these objections aren't enough, cloning an army would be an astonishingly costly and inefficient way of getting an army.

*Figure 1. A 1999 British stamp commemorating the first test-tube baby.*

First you'd have to get lots of nuclei, and then lots of uteri. Then you'd have to let the embryos come to term. Then you'd have to wait another 18 years or so before the clone army would be old enough and trained enough to go into combat. Wouldn't it be a whole lot easier to raise an army the old fashioned way —draft young men when they are of age? Thus, the "army of automatons" objection turns out, with a little thought, to be just plain silly.

What if the cloning process turns out humans who are in some way abnormal? Perhaps there will be physical harm. But certainly, before it becomes generally available, human cloning would have been tested on primates to establish its safety, just like any other medical procedure. Or perhaps there will be psychological harm, with cloned children seen by their peers as "freaks." But how would anyone know if a given child (or adult) is a clone? They won't have a bar code birthmark on their forehead, or the word "clone" in big red letters on the backs of their hands!

Other, more scientific-sounding objections fare no better when subjected to Pence's penetrating analysis. For example, maybe human clones would reduce human genetic diversity. But, if and when it becomes available, human cloning will be an expensive procedure to be used only in extreme situations. There will be few human clones out there. Most people will continue to produce their offspring via the considerably more enjoyable procedure of having sex.

Pence points out that the arguments against human cloning are very similar to those put forward against "test tube babies" (now known as in vitro fertilization—IVF) in the late 1970s. In fact, the clamor over IVF was nearly as great then as the clamor over cloning is now. But, twenty-one years after the birth of Louise Brown, the first IVF baby in 1978, IVF is so widely accepted that it has just been commemorated by the British Post Office. The 63 pence denomination in the BPO's "millennium" series of stamps noting great events of the century illustrates a small bronze statue of a baby commemorating Ms. Brown's birth (see Figure 1).

In addition to the specific objections to human cloning, there has also been a lot of hand wringing with a more philosophical tone. Pence (p. 46) quotes Nigel Cameron, a bioethicist and theologian at Trinity International University (Deerfield, Illinois) as saying that human cloning "would be perhaps the worst thing we have ever thought of in the maltreatment of our species. It [sic] would be a new kind of slave class. You would have human beings who were made by other human beings for their purposes." But, as I've noted, there is no reason whatsoever to think that cloned humans would be slaves. The parents who went to all the trouble to have a child via cloning would, if anything, be especially loving of that child. And what about these children being made for their parents' "purposes"? Well, yes—but how is this different than

when two people have sex to have a child? That child, also, was made for the parents' "purpose"—the purpose of having a child.

Another example: Well-known bioethicist Leon Klass of the University of Chicago (quoted on p. 46) has said, "It is not at all clear to what extent a clone will truly be a moral agent." Of course it's clear. Cloned humans are going to be just as human as you and me and will have all the legal rights of any other human being in whatever society they are born into.

Along these lines, Pence is critical of the failure of most "physicians, distinguished scientists, and some well-known bioethicists" (p. 36) to reduce the misinformation that flooded the press after Dolly. Some of this misinformation, as the quotes above demonstrate, was actually produced by these very people.

Pence is especially scathing in his discussion of the National Bioethics Advisory Commission (NBAC), the board that President Clinton ordered to come up with a recommendation on human cloning following Dolly. The Commission recommended a total ban on human cloning. Pence notes that this was done with no real debate on the issue. The Commission knew that Congress wanted a total ban, and it provided one. Proponents of human cloning were not welcome to testify before the Commission, although a large number of individuals who objected on religious grounds presented their views.

Pence argues convincingly that the horrors and dangers of human cloning have been vastly exaggerated and that the procedure should be seen as nothing more than another reproductive option. In a free society government has no business limiting safe reproductive options, certainly not on religious grounds. He makes the most valuable suggestion that the emotionally charged word "clone" be dropped and replaced by the more accurate and descriptive term "nuclear somatic transfer" or NST, just as "test tube baby" was replaced by IVF. □


# SCIENCE BEST SELLERS

## Top Ten Best Sellers in **Melbourne, Australia**

**1** ***The Last Mortal Generation***
Damien Broderick
New Holland

**2** ***The Fifth Miracle***
Paul Davies
Allen Lane

**3** ***More Big Questions***
Paul Davies
ABC Books

**4** ***Munching Maggots***
Karl Kruszelnicki
HarperCollins

**5** ***Above & Beyond***
Paula Bycroft and
Anthony Griffs
Hodder Headline

**6** ***Lamarck's Signature***
Edward Steele
Allen & Unwin

**7** ***Wizard of Oz***
Peter Spinks
Allen & Unwin

**8** ***Defending the Little Desert***
Libby Robin
Melbourne University Press

**9** ***Altered Genes***
Richard Hindmarsh et al.
Allen & Unwin

**10** ***The Feynman Processor***
Gerard Milburn
Allen & Unwin

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## NEW BOOKS

***Contact: Are We Ready for It?* Peter Schenkel.** Minerva Press, London, Sydney, and Atlanta (in U.S., order from Communications Plus, 2103 North Decatur Rd., *Suite 335, Atlanta, GA 30033*). *1999. ISBN* 0-75410-432-X. 298 pp. Softcover. £8.99. We don't normally note fiction in this column, but this new novel about the repercussions of first contact with aliens will appeal to many rationalists and skeptics. Written in a realistic style, reminiscent of novels on the same first-contact theme by scientists Harrison Brown and Carl Sagan, this one *focuses not on technology and science but* on the political, social, and ethical problems that might arise on first hearing from aliens. The main characters include a clearly Saganesque astronomer and SETI expert, and the interactions at the international political level seem especially well handled, not surprising since the author is a political scientist. There is also great understanding of *forces of irrationalism, the dynamics of the* media, and the interactions of all with the scientific community.

*—Kendrick Frazier*

## ARTICLES OF NOTE

**Gould, Stephen Jay. "Dorothy, It's Really Oz."** *Time*, August 23, 1999, p. 59. Essay written immediately after the decision by the Kansas Board of Education to remove evolution from the state's science curriculum. For Americans "of goodwill" who might suppose there is some genuine scientific or philosophical dispute behind this issue, Gould offers three points to alleviate their worries: First, no other Western nation has endured any similar movement, with any political clout, against evolution; second, "evolution is as well documented as any phenomenon in science, as strongly as the earth's revolution around the sun rather than vice versa"; and third, no factual discovery of science (statements about how nature "is") can, in principle, lead us to ethical conclusions (how we "ought" to behave) or to convictions about intrinsic meaning (the "purpose" of our lives). "As patriotic Americans, we should cringe in embarrassment that, at the dawn of a new, technological millennium, a jurisdiction in our heartland has opted to suppress one of the greatest triumphs of human discovery. Evolution is not a peripheral subject but the central organizing principle of all biological science."

**Larson, Edward J., and Larry Witham. "Scientists and Religion in America."** *Scientific American*, September 1999, pp. 88–93. Science and religion are engaging in more active dialogue and debate, but a survey suggests that scientists' beliefs have changed little since the 1930s, and top scientists are more atheistic than ever before. Article reports on the authors' several widely publicized surveys and then goes beyond that to discuss possible reasons for the unbelief of top-ranked scientists (90 percent of members of National Academy of Sciences) compared with scientists in general (of whom both old and recent surveys indicate 40 percent believe in God). The article goes on to discuss the evolution/creationism controversy, the several different wings of the science vs. religion debate, whether there can be religion without a God or the supernatural, and issues raised by such things as the Templeton Foundation's conferences on science and the spiritual quest.

**Lemonick, Michael D., and Andrea Dorfman, "Up from the Apes."** *Time*, Aug. 23, 1999, pp. 50–58. In a cover article that, with wonderful coincidental timing, came out a few days after the notorious Kansas antievolution decision, *Time* presents a rounded view of remarkable new scientific evidence filling in the story of how we became human. Four new species of hominid have been added to the human family tree since 1994, dating from 800,000 years ago all the way back to 4.4 million years ago. In addition, newly discovered fossils of existing species further help trace the complex relations among our diverse ancestors. An excellent, accessible report about the frontiers of discovery about human evolution.

* * * *

**Matthews, Robert. "The Power of One."** *New Scientist*, July 10, 1999, pp. 27–30. Everyday numbers obey a law so unexpected it is hard to believe it's true. Armed with this knowledge, it's easy to catch those who have been faking research results or cooking the books. A fascinating article about Benford's law, which shows that among numbers culled from any variety of sources, around 30 percent begin with the digit 1, 18 percent with 2, and so on. Recent research has verified the ubiquity of the effect, which is unaffected by changes of units, placed it on solid mathematical ground, and begun to apply it in a variety of ways, including fraud investigations, where it is being hailed as the biggest advance in the field in years.

**Nantais, Kristin M., and E. Glenn Schellenberg. "The Mozart Effect: An Artifact of Preference."** *Psychological Science*, 10(4): 370–373, July 1999. The "Mozart effect," reported by three researchers in 1993 and 1995, indicates that spatial-temporal abilities are enhanced after listening to music composed by Mozart. The authors replicated and extended the effect in Experiment 1: Performance on a spatial-temporal task was better after participants listened to a piece composed by Mozart or by Schubert than after they sat in silence. In Experiment 2, the advantage for the music condition disappeared when the control condition consisted of a narrated story instead of silence. Rather, performance, was a function of listeners' preference (music or story), with better performance following the preferred condition. They conclude that although listening to Mozart might lead to improved performance, "our results provide no evidence that the improvement differs from that observed with other engaging auditory stimuli that are equally pleasing to participants."

**Scott, Eugenie C. "Creationism Evolves."** *Scientific American*, August 1999, pp. 92–94. Essay review of Robert T. Pennock's *Tower of Babel: The Evidence Against Creationism* evolves into a useful discussion of "intelligent-design creationism" and all the relevant issues, including the U.S. public's ready acceptance of the Argument from Design and of creationists' portrayals of science as materialistic.

**Steele, Kenneth M., Karen E. Bass, and Melissa D. Crook. "The Mystery of the Mozart Effect: Failure to Replicate."** *Psychological Science*, 10(4): 366–369, July 1999. As in the paper by Nantais and Schellenberg (above), this experimental report examines the so-called Mozart effect. Steele et al. attempted to produce a Mozart effect by following the same procedural instructions and replicating the procedure of one of the original positive reports. The experiment failed to produce either a statistically significant Mozart effect or an effect size suggesting practical significance. They conclude that "there is little evidence to support basing intellectual intervention programs on the existence of the Mozart effect." (See also another brief report by Steele and nine colleagues, and a separate brief report by Christopher F. Chabris, in the Scientific Correspondence section of *Nature*, 400:826–827, Aug. 26, 1999, both under the title "Prelude or Requiem for the 'Mozart Effect'?" Then F.H. Rauscher, one of the authors of the original, positive reports, in 1993, replies.)

*—Kendrick Frazier*

# Thumbs Down on Fox's "Signs from God"

JOE NICKELL

The Fox television network's airing of "Signs from God" (July 28, 1999) represented a new low in journalistic ethics. Subtitled "Science Tests Faith," the program was actually an embarrassing promotion of a particular belief system through staged "miracles" and the cunning misuse of science. Given the Fox network's shameless history of programs that sensationalize the paranormal, "Signs from God" was the equivalent of a religious "Alien Autopsy."

Unsuspecting viewers were treated to a litany of provocative claims—bleeding statues, messages from Jesus, stigmata—that were "investigated" by Australian journalist Michael Willesee. Actually, although representing himself as a skeptic, Willesee betrayed an agenda to promote such alleged phenomena as authentic. Going beyond mere mystery mongering, he employed science in only a very limited way, repeatedly avoiding skeptical experts in the specific fields (such as investigators knowledgeable of "weeping" statues) and often bypassing the essential tests necessary to detect fraud. For instance, no doctor examined a stigmatist's wounds and no attempt was made to keep her from inflicting them surreptitiously, but the blood was afterward tested and proved to be her blood—as expected.

Similarly, no scientific protocol was followed in ruling out trickery with a "weeping" and "bleeding" bust of Jesus; however, a CAT scan of dubious relevance was afterward employed "to test for the possibility of trickery or fraud," and the blood was forensically examined. When it was found to be *female* blood, a startled Willesee suggested that that might be due to Jesus' having had only a mother and no Earthly father.

Such stubbornness, or perhaps sheer ineptitude—or worse—kept the program from presenting evidence that was contrary to the claims being made. For example, the stigmatist, Katya Rivas from Bolivia, was never shown actually producing a wound, but rather was presented in incremental shots after each appeared: first the supposed crown-of-thorn marks on the forehead, then those on the hands and feet. The event took place in her bed, and her bed covers provided ample means for concealment of an object that might cut her skin. Moreover, freeze-frame examination of the video reveals that the wounds on her hands and feet were comprised of multiple slash marks, not single nail-like punctures, and the location of the wound on the top of her left foot was far out of alignment with that on the bottom, suggesting they were indeed made separately.

Weeping statue as seen on Fox. ©1999 Fox Broadcasting Company.

Many phenomena went totally unexamined, or the examination was not reported, including the appearance of an image of the Virgin on a concrete floor (looking like nothing more than the work of an unskilled artist) and the multicolored "glitter" that supposedly manifested itself on a print of the Image of Guadalupe (itself a bogus but widely revered "miracle" picture: see SKEPTICAL INQUIRER, Spring 1985, pp. 243–255).

Doubtful evidence was hyped, while more prosaic explanations were glossed over or went unmentioned. Ms. Rivas, for instance, was shown producing an unusual "delta state" on an EEG, while a neurologist's suggestion that there "could be epilepsy" was not further explored. (Perhaps significantly, temporal-lobe epilepsy is often associated with visionary experiences.) And when an art conservator and a botanist each demonstrated that image-bearing rose petals had been faked (they even duplicated the effects by pressing petals with small medallions), Willesee became flustered and tried to redeem the claim. He suggested fakery was unlikely because the "miracle" petals were not being sold, ignoring the possibility of what skeptics term "pious fraud"—deception used in an end-justifies-the-means manner to promote religious belief. Too little was heard from a scholarly Catholic priest who cast doubt on the various phenomena presented and suggested the possibility of trickery.

The uncritical journalism of executive producer Michael Willesee was surprising considering his earlier skeptical reporting on such topics as psychic ability, dowsing, and acupuncture. For these efforts, Willesee received in 1987 the Responsibility in Journalism Award from CSICOP. But in producing "Signs from God" both Willesee and Fox Television have shown a willingness to betray skepticism and balanced journalism in favor of ratings and profits.

*Joe Nickell is author of* Looking for a Miracle *(1993).*

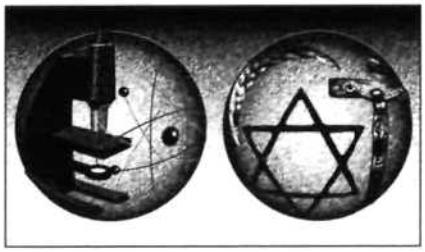
*The response to our special issue Science and Religion: Conflict or Conciliation? (July/August 1999) was the largest we ever received to a single issue. It was overwhelmingly positive. Of the more than 140 letters and e-mails we have received (more were still arriving at our time cutoff), only two complained of our devoting so much space to the topic. Most readers expressed appreciation. Many had thoughtful observations or criticisms of articles. We here present selected letters divided into two large categories: those addressing diverse points made throughout the special issue and those that focused specifically on the Non-Overlapping Magisteria concept advocated by Stephen Jay Gould.—THE EDITOR*

## I. Science, Religion, and the Human Condition

I was pleased with the special issue on science and religion, and especially with the articles by Palevitz, Kurtz, Scott, and Dawkins.

The general view seemed to be that there need be no conflict if the two institutions stay within their own domains. But that's a mighty big "if." What wasn't emphasized is that this condition doesn't, and can't, exist because of the inherent nature of religion, perhaps even of human nature itself.

Religion has been steadily eroded ever since science began learning how the universe actually works. In order to survive, it must either discredit science or claim the findings only confirm its doctrine. Either way science loses. Unfortunately, some scientists are just as unnerved as the rest of us by what they are learning, so they resort to



mysticism in an attempt to make it a little easier to take. It won't work, and they are doing the whole cause a disservice.

Gould's essay says he is not religious, yet has a great respect for religion. That puzzles me. I am not religious, and none of the reasons I'm not give me any need to respect it.

According to the review of Chet Raymo's *Skeptics and True Believers* he is on the side of science but considers research a kind of mysticism, an effort in which we "interrogate God." Seems like a curious kind of support.

Overall though, the issue was a good, and much needed, rebuttal to the current trend toward marrying science to religion.

Jerry Brown
Culver City, Calif.

One can define truth as being composed of two parts, verified facts judged against verified standards of right and wrong. Stripped to the core it is the business of science to verify facts, and it is the business of religion to verify standards of right and wrong as they apply to civilized behavior.

The earliest teachers of moral values were the first to see that standards of decency had become necessary—that the old ways had to be changed. Our great discoverers were the first to see that previous generations had guessed incorrectly about nature's ways.

Where science and religion cross paths is in the branches of science where human behavior comes into play. This includes not just behavioral science, but also biological and medical science. For example, it is as important to discover the worth, or harm, of our "fight or flight" unconscious reflex action as it is to discover its mechanism. Judging, in this sense, should be used for the purpose of finding truth, not for condemnation or punishment.

A scientific discovery (corrected misconception) does us no good if it is not accepted as a universal truth. The negative attitude held toward evolution by fundamentalist Christians reveals the dark side of the "fight" response—the resistance to truth, and the desire to fight for an untruth. Their war-like attitude can not only be recognized in their diatribes against science, but also in their literal translation of Armageddon. By no stretch of the imagination does their behavior conform with the standards of civil behavior set down by the fathers of all our legitimate religions.

Science, having a history of being challenged by religious proselytizers, should not fall into the same defensive mind-trap. The testimonies of our wisest ancestors should be heeded. What else can an eye-opening discovery about human behavior be called but a "revelation" of truth? It is easy enough to separate false prophets from those who see the handwriting on the wall—the former are militaristic, and the latter are peaceniks.

Our further evolution depends on clearing up our misconceptions, whether they are misconceptions about nature's ways, or misconceptions about right and wrong. This is the responsibility of science and religion, but it is also an individual responsibility.

Our survival depends on knowing the facts, and on being able to judge correctly our own attitudes towards these facts, as well as the attitudes of our leaders, and would-be leaders, both past and present.

Joan Morrone
Sebring, Fla.

As Kendrick Frazier points out in the July/August 1999 issue, science and religion differ fundamentally. At the same time, however, science and religion share a critically important feature: they both necessarily involve the behavior of people. For decades behavior analysts have been describing, interpreting, and in some cases experimentally investigating people's behavior from a natural science stance. Behavior analysts are interested in all aspects of people's behavior, including how they behave as scientists and how they behave as adherents of religions. Unarguably, therefore, at a fundamental level, science and religion are of a piece: they both involve human behavior.

Paul Kurtz ("Should Skeptical Inquiry be Applied to Religion?") correctly maintains that religion and science are different forms of human behavior that have different functions. The discipline of behavior analysis can help shed light on just how those forms of behavior differ and just what different functions they serve.

P. A. Lamal
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Charlotte, N.C.

The symposium on religion and science was thought provoking. However, it omitted the all-important political function of religion. The root of the very word is "that which binds us together." Historically, religious belief systems have been the cement of social groups, and their most important characteristics seem to be the ability to produce social cohesion and not any logical content. Might not the power of religion increase in places of social conflict? This is well illustrated where I live. The Civil Rights movement was promoted from the "black" churches which were the only political institutions

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permitted Afro-Americans and opposed by many of the "white" fundamentalist churches. Both cited Biblical authority. The Galileo case and Scopes trial both took place during struggles for authority between major power blocks. Recently, one of our most powerful politicians ascribed school shootings to day care centers and the teaching of evolution! He was, of course, addressing a religious block which is threatened by changes in the status of women and based in the south. Religion is politics. Science (ideally) is not.

John D. Davis
Jackson, Miss.

In his article "Whence Religious Belief" (July/August 1999), Steven Pinker raises "the question of why a mind would evolve to find comfort in beliefs it can plainly see are false." Our minds are the product of evolutionary pressures that are hundreds of thousands to millions of years old. It may be that at some time in the past, beliefs of this nature were advantageous to survival. Common beliefs, no matter how false they were, could have provided a bond that held individuals in a group. And group membership probably increased the survival chances of the individuals in the group. Our propensity toward religious belief may be more of the baggage that we have dragged along with us in our evolutionary journey.

Jerry F. Kerrisk
Santa Fe, N.M.

The July/August issue of the SKEPTICAL INQUIRER with its excellent articles on science and religion reminded me of my years in a liberal non-denominational theological school. If a student raised serious questions about the validity of theism one was considered out of bounds. You either believed, or why were you there? I was there because I assumed they had objective evidence to validate their faith. They did not have such evidence. The dualistic position holding that religion deals with values and science with the material world runs counter to a basic concept that truth is one. Certainly nearly all liberal religionists are happy with the dualistic approach. They can affirm a belief in God and also in evolution. I believe the essential unity of truth precludes dualistic approaches to reality. If truth is one, our values are based on human experience, not on the will of God. They spring forth from our experience in nature and society. We need to stand free of theological ethnocentrism.

Say a tornado rips through a community. Some people are killed, others injured, and buildings are destroyed. A survivor says, "God saved me. He must have some plan for me." The humanist says, "I am terribly sorry that people were injured and killed by the violence caused by atmospheric pressure imbalances."

Unfortunately, dualism confuses the issue and retards intellectual enlightenment. The entire muddle is clarified by a non-theological view of life with an affirmation of values rooted in human experience. The God concept and related religious concepts need to be eliminated from our thinking. They are detrimental to our ability to comprehend life.

Eugene Kreves
Tumbling Shoals, Ark.

*(Founder and Minister Emeritus of The Du Page Unitarian Church Naperville, Illinois)*

Although I am an atheist, I agree with Mr. Kurtz that CSICOP and SKEPTICAL INQUIRER should not deal with religious issues as a primary focus. I believe both the organization and the magazine have more than enough on their plates as it is and there are other ways for skeptics to address religious issues.

John O. Stewart
Leadville, Colo.

I thoroughly enjoyed Volume 23, No. 4 of the SKEPTICAL INQUIRER (as I tend to enjoy nearly ever issue).

I find the notion of science and religion as "Non-Overlapping Magisteria" and similar positions unsatisfying. Religion as a sociocultural phenomenon is not limited to the highly intellectualized debates between theologians and philosopher/scientists where the overlap with science can be redrawn into a neat boundary. Rather, religion as a social phenomenon consists of alternative models for describing, explaining, and controlling natural phenomena, including human behavior. This is the same territory claimed by science. The presence of this overlap, and the logical incompatibility of faith statements and statements based on reason and observation, make a rapprochement of the two systems of thought unlikely. While it seems entirely possible that religion may retreat in the face of compelling demonstration of the laws of science (logic and data are optional in religious thought, so incongruity of such a retreat is of no consequence to the faithful), it doesn't work the other way. The religious minded may interpret scientific laws as a statement of the mind of God without violating the nature of faith systems. However, how can statements about divine intervention ever be squared with scientific logic? It is incongruous to introduce faith statements into a system that demands reason and data.

Compartmentalizing religion and science as separate, non-antagonistic systems may be a way of avoiding mental discomfort related to embracing both logic and superstition, but at the cost of deluding ourselves about the nature of our existence. . . . We are flawed thinkers that have developed an ingenious set of principles (the scientific method) to help us rise about our deficiencies, if only a little. Failure to recognize that faith statements arise from essential flaws in brain functioning is a denial of the fundamental nature of the mind. . . .

David E. Cournoyer
University of Connecticut
School of Social Work

For anyone who remembers Jacob Bronowski's essays on *Science and Human Values* published more than forty years ago, the fourteen major articles in your special issue on science and religion are a major disappointment. I have written detailed critiques of each of these articles for the Godless Web Site (www.godless.org), the Web home for the Humanist Association of San Diego.

With a few exceptions (the articles by Paul Kurtz and Richard Dawkins are quite good), the box score is dismal. At least half of the skeptics whose articles appear in this collection see no problem when religion claims to be an alternate or complementary path to truth, independent of science and empirical observation. They agree with religious believers that supernatural claims are outside the area of competence of science. While expressing some doubts about religion's claim to be the single authority on matters of ethics, morality, and meaning, they still subscribe to the myth that science must remain silent about these matters. Not one (not even Kurtz or Dawkins) seemed to be aware that science is itself a system of ethics, with the obligation to tell the truth an essential component in its method. . . .

And, while Stephen Jay Gould, Steven

Novella and David Bloomberg, and Barry Palevitz would have science be silent concerning meaning, ethics, and morality, it is in fact the best foundation for morality that human beings have ever come up with, requiring as a social prerequisite for methodological success a commitment to the ethic of truth-telling. In the words of Bronowski, science requires that "We ought to act in such a way that what is true can be verified to be so." . . .

Norman F. Hall
San Diego, Calif.

The series of articles in the SKEPTICAL INQUIRER on science and religion was both interesting and disappointing. It merely presented a survey of the personal opinions of prominent thinkers rather than any systematic framework. With this approach there will never be any progress in resolving the controversy. Rational inquiry demands more. It is not a single issue but many underlying issues, some with the potential for conciliation while others with irreconcilable conflict.

First and foremost, the relationship of science to religion has always been cast in the wrong framework of the physical versus the spiritual or transcendent. The vital issue is between the *known* and the *unknown*—what is the nature of the unknown, what claims are made about the unknown, and most importantly how anyone (religion or science) learns anything about the unknown.

The key question all scientists must answer with regard to their personal beliefs is not whether God or spiritual realm exists but if there is a different way of knowing about any realms that contradicts the fundamental process by which science gains knowledge and understanding. A belief in a spiritual realm or God can potentially be reconciled with science. But a religious claim to knowledge through divine revelation or mysticism that has to be accepted on faith alone and never questioned nor even rationally analyzed is the antithesis of science.

Bryan Sellers
Cincinnati, Ohio

Eugenie Scott, in her article "The 'Science and Religion Movement'" quotes Einstein approximately thus: "Religion without science is crippled, while science without religion is lame." This quote is often cited to show that Einstein was really a believer. However, this comes from an essay "Science and Religion" that Einstein wrote for a symposium held in New York in 1941. In this essay Einstein makes clear that he does not believe in a personal God, but that his faith is "the faith in the possibility that the regulations valid for the world of existence are rational, that is, comprehensible to reason." He says that "for the ethical good, teachers of religion must have the stature to give up the doctrine of a personal God, that is, give up that source of fear and hope which in the past placed such vast power in the hands of priests."

This is a far cry from a conventional religious attitude. Incidentally, Einstein's exact quote from this source was: "Science without religion is lame, religion without science is blind." It has been suggested that this is a play on Kant's "Notion without intuition is empty, intuition without notion is blind."

My source for the above is *The Quotable Einstein*, edited by Alice Calaprice, Princeton University Press 1996.

Marvin J. Schissel
Woodhaven, N.Y.

## II. Non-Overlapping Magisteria . . . or Not?

Stephen Jay Gould's article on Non-Overlapping Magisteria (NOMA) is a thought-provoking discussion on the separation of church and science. He arrives at a very gentlemanly position, and it is a stance that may be appropriate for dinner parties where one wants to prevent heated arguments. As an academic position, it is a little like declaring Earth to be only 7,000 years old. Saying that religion and science have no areas of common authority doesn't make it so. And to believe that they don't overlap requires ignoring a mountain of evidence to the contrary.

History itself is the most powerful counter-argument to NOMA. Science and religion both grew out of human attempts to explain the world. That each may have developed a different methodology doesn't mean that they now have no areas of dispute. Consider the passions ignited by such issues as abortion, creationism, gender identity, sexual preference, the origins of violent behavior, the nature of alcoholism, child development, and many other areas where religious and scientific agendas clash. I don't think Gould could argue to the principals in any of these controversies that their intellectual interests did not overlap.

On many scientific issues there is no longer disagreement by some religions (Gould cites evolution and also mentions Galileo's problems with the church). But this is largely due to the concession by major religion that science has proved its points. The success of science has reduced the areas in which theologians can credibly disagree with scientific positions. But again, the very fact that this process has taken place is an argument against NOMA, not for it. . . .

That brings me to what I think is the most serious weakness of NOMA. It is basically condescending to religion. This assertion may shock Gould, who undoubtedly is trying to be very respectful of his counterparts on the other side of the NOMA divide, but one rarely bows out of a discussion with an opponent that one respects. It is hard to imagine a vigorous, academic debate being stopped unless one side feels the other is either not worth the effort or not able to cope with serious disagreement. Agreeing to disagree still means that you disagree.

Brad Goldberg
Studio City, Calif.

The special issue on science and religion was very welcome. Our inconsistencies are what make us human I suppose. I confess that I was amused by Stephen Jay Gould's ready acceptance of the Pope's view of how humans came to have souls. Either souls affect the way the body works, in which case neuroscientists will have a say in the matter, or they do not, in which case it hardly matters one way or the other for science or religion. However, what surprised me most was that no one seemed to address the social purpose of religion.

My view of the world is probably about the same as Richard Dawkins's. Religion explains nothing and should not be taken seriously in descriptions of the real world. Where I differ is in recognizing the social importance of religion. I suspect that one of the reasons that religious ideas are so persistent is that they deal with our mortality. Death and subsequent nonexistence are not pleasant prospects. The idea that there might be something else can be a great comfort to the terminally ill or the bereaved. As a rationalist, I can give these people explanation, but I cannot give them hope.

At its best, religion can also provide a vehicle for social cohesion and a catalyst for charitable deeds or even an impetus for

social change. At its worst, of course, it can lead to bigotry, intolerance and persecution. . . . The New Testament is rather high on social welfare and low on metaphysics. For all the born-again egoists, there are many whose selfless efforts make a real difference our society. I am not sure that secular organizations generate this level of commitment.

So the question is not the one addressed by most of your contributors: Can religion tell us anything about the world in which we live? It is whether scientific rationalism can replace the social function of religion. Maybe it can, but for the moment I am happier that people needing help go to a priest trained in counseling than to a New Age charlatan more interested in making money.

Prof. Peter Main
School of Physics and Astronomy
University of Nottingham
Nottingham, U.K.

Judging from Richard Dawkins' article, Non-Overlapping Magisteria is going to be difficult to implement. Religions claim questions of morality and apparently are supported by S. J. Gould. Dawkins questions the record of religion and concludes that we have some alternative source of ultimate moral conviction.

E. O. Wilson apparently would agree. In *Consilience*, he suggests that ethical codes have arisen by evolution through the interplay of biology and culture (page 251). He goes further to place ethics and morality in the domain of science:

> The idea of a genetic, evolutionary origin of moral and religious beliefs will be tested by the continuance of biological studies of complex human behavior. To the extent that the sensory and nervous systems appear to have evolved by natural selection or at least some other purely material process, the empiricist interpretation will be supported. It will be further supported by verification of gene-culture coevolution, the essential linking process described in earlier chapters (page 264).

This advance of science into a traditional area of religion seems to have merit.

Later in his article, Dawkins accuses religion of encroachment into the domain of science. He claims that the Roman Catholic doctrines of the Virgin Birth, the bodily assumption of the Blessed Virgin Mary, the Resurrection of Jesus, and the survival of souls after death, are scientific questions. Such an assertion requires a much greater defense than offered by Dawkins, because the doctrines deal with the supernatural, which is outside the purview of science. Science has no way of proving them false. . . .

Allan D. Halderman
Oregon City, Ore.

Richard Dawkins provides a dose of pure oxygen that clears that hazy atmosphere that often surrounds discussions of religion (July/August 1999). I would add one thought. It seems to me that we must define "supernatural." If this word refers to events or beings acknowledged to be fiction, then indeed science has no interest in them. On the other hand, if claims are made that these events or beings are real, then science has a legitimate interest in testing these claims, for many supernatural events and beings, if real, would change fundamental physical laws.

It would appear that many scientists think that "supernatural" means "fiction," and many religious people believe that "supernatural" means "special but real." Problems arise when the term is left undefined. It puzzles me that scientists such as Ernst Mayr contribute to this confusion. Mayr says: ". . .souls, spirits, angels, or gods. . . . Such supernatural constructions are beyond the scope of science." Why? If they actually exist, and since "[t]he world and all that is in it are the sphere of interest . . . of scientists . . .", then let us discover these new laws.

I think what Mayr and others mean is that such claims are fictions, and fictitious constructions are not a concern for science. However, I suspect that the central myths of religion are held to be factual rather than fictitious by more than just the fundamentalists. I cannot remember ever hearing a cleric read scripture to a congregation and then remind her audience that it is fiction.

Thus the non-overlapping magisteria amount to the study of the world through evidence on the one hand, and fiction often presented as fact on the other.

Jerry Shedd
Ripton, Vt.

S. J. Gould's article suggests that we look to religion "for grounding moral discussion, and for expressing what we most value about human potentiality: our decency, our care, and all the ethical and intellectual struggles that the evolution of consciousness imposed upon us."

I wonder why must we cede morality (and the moral high ground) to religion? What quality does religion possess that qualifies it for such a distinction? A look at its history reveals a trail strewn with bigotry, violence, and xenophobia.

The problem is that morals are a social construct—developed among peoples through negotiation (and conflict) to define acceptable behaviors. Are the debates contentious? Certainly! Do morals change and evolve over time? Yes!

And that's the problem with formalized religions and morality. Their morality was created primarily to control and unite their particular cultures. To lend their morals credibility, they attributed them to gods and proved their veracity with miraculous cosmologies.

Unfortunately, this attitude stifles the discussion of morals today. No negotiation can occur with an absolutist. In a multicultural, democratic world, this kind of un-reasoning is poison. I could argue on those grounds, that religions should be *excluded* from discussions of morals.

It is up to each of us to define and discuss "what we most value about human potentiality," and to base this on reason and on our experience of the world today—not the world 2,000 or 10,000 years ago. We create morals to help us get along with each other, to help our culture be more fair. Is it easy? No. But let's not default to faith rather than actively participate in this critical struggle. I'm not sure if science has a role, but I know that scientists do.

Keith Eckert
Carlisle, Pa.

Stephen Jay Gould in his article "Non-Overlapping Magisteria," contends of Catholicism and Judaism that "neither religion maintains any extensive tradition for reading the Bible as literal truth, other than illuminating literature based partly on metaphor and allegory . . . and demanding interpretation for proper understanding."

That statement is incorrect. The entire medieval tradition of four-fold allegorical interpretation, informing a voluminous exegetical literature, had as its first level the literal, the truth of which *had to be assented to if the text was canonical.* The other three levels (anagogical, allegorical, and tropological) were merely mystical "types," expanding the literal truth to the heavenly Jerusalem, the Church, and the individual soul respec-

tively. Certainly for the Pope and for millions of Catholics to this day, the New Testament is not "illuminating literature"; it is the sacred, God-inspired text which serves as the foundation of their faith.

Frank Reuter
Berryville, Ark.

The major problem with Gould's Non-Overlapping Magisteria theory is its assumption that religion has a "higher insight into moral truth" than does science. Gould correctly notes that science does not have such a higher insight, but the implication is that religion does. True, religion tells us what ancient peoples thought about morality, something that should be weighed in our current moral thinking. But science also tells us the way things work, something that also must be taken into consideration. Yet Gould seems to ignore the possibility that independent moral philosophers, not beholden to a religious tradition, would have a more balanced view of ethics. In doing so, he turns ethics over to a group of people who are no more qualified to pronounce on morals than are scientists.

The cute dictum that science studies "how the heavens go" while religion teaches us "how to go to heaven" glosses over the fact that ethics should not depend on what behaviors led to a reward in the afterlife, but rather on how best to make life livable and civilized—in a word, better—in this world.

Charles Kluepfel
Bloomfield, N.J.

Stephen Jay Gould's NOMA has been breached most recently by the discipline of evolutionary psychology, which teaches that our moral behavior has, to a significant extent, been determined by the same evolutionary pressure that sculpted our physical attributes. A look at the primatologic studies of De Waal in *Good Natured* and the contrasting ones of Wrangham and Peterson in *Demonic Males* indicates why our moral behavior reveals varying amounts of good and evil in each of us. I submit this is a better explanation of our moral natures than the Christian doctrines of original sin and divine grace.

Irving N. Wolfson
Worcester, Mass.

Praise for your informative and exciting July/August special issue dealing with science and religion, which provided me with my first opportunity to read something by Stephen Jay Gould, whose "Non-Overlapping Magisteria" almost made me want to run out and hug a Christian.

Almost, but not quite.

Reality was once again brought home by Richard Dawkins, and I resumed my somewhat hard-line position toward religion, actually sorry, to a degree, that this had to be so. But Mr. Gould, in spite of his truly excellent article, failed to provide any usable argument against what is a glaring problem for me and Mr. Dawkins regarding religion. My view has always been that religion, by its very nature and by virtue of its very existence, represents an ongoing invasion into the scientific field. The religious claim of a "supernatural" realm full of supernatural entities, with an all-powerful deity at the head, all of which, it is claimed, can and do insert themselves into our "natural" realm, reduces what we call natural laws to the level of mere temporary rules; rules that remain in force only until an angel or the Virgin Mary decides to make a visit and place them on hold. . . .

Peter Cushnie
Milford, Conn.

I am a regular reader of SKEPTICAL INQUIRER and *Free Inquiry* and look forward to each issue. The SI special issue on science and religion was of particular interest. However, I am alarmed at what seems to be a trend: to talk of the "two magisteria" and try to neutralize or lessen the conflict between the rational way of looking at the world and the irrational way. This is especially exemplified by Stephen Jay Gould and Chet Raymo. Come on, guys, I don't see how you can say things such as that you "have great respect for religion" and that you want to see a "loving concordat" (Gould, p. 60 in "Non-Overlapping Magisteria"). Nor should we seek "spirituality" in science *a la* the late Carl Sagan. Emotional states are not "spiritual" in the sense the religionists advocate.

The scientific approach deals with the real world as best we can and is always ready to change if facts merit it. Religion deals with imaginary worlds which are not constrained by facts nor even by logic. We should not waste any time trying to arrive at "loving concordats" with any or all of the dangerous nonsense spun off by the religionists. Certainly we should not accept their claim to be able to make moral/ethical judgments. Their morals/ethics are just as imaginary as their souls, sin, salvation, gods, angels, and all their other fantasies.

Steven Pinker and Richard Dawkins have it right: "You Can't Have It Both Ways"! Rationalists (skeptics) cannot admire delusions! We will not gain by pretending there is a middle ground and pandering to the religious majorities. We have no "souls to save" and if we remain a minority, it is enough to know that we are pursuing truth, not inventing it. It is just another fact of nature that most humans are not very intelligent and easily deluded.

M. Lionel Bender
Professor Emeritus
Southern Illinois University
Carbondale, Ill.

The opposing views presented by S.J. Gould and Richard Dawkins in your July/August issue were both stimulating and informative. It would appear that Mr. Gould, by leaving out a key portion of Pope John Paul's encyclical, i.e. ". . . consequently, theories of evolution which, in accordance with the philosophies inspiring them, consider the mind as emerging from the forces of living matter, or as a mere epiphenomenon of this matter, are incompatible with the truth about man . . .", has weakened his position even as Mr. Dawkins has strengthened his argument by quoting it.

Those of us who were raised as religious fundamentalists with a literal acceptance of the Bible have probably found it easier to abandon those views than others who were brought up in the more intellectual and non-literalist religions. I would suggest that Mr. Gould is not suffering from a "cowardly flabbiness of the intellect" as implied by Mr. Dawkins but instead has perhaps become the victim of another phenomenon, nostalgia.

It is amusing to see both of these men of reason fall into the trap of what the late Carl Sagan referred to as "common and perilous fallacies of logic and rhetoric"; being in this case ad hominem and observational selection.

Jack D. Taylor
Flagstaff, Ariz.

I greatly enjoyed the special issue Science and Religion—the Mike Reiss piece was hilarious—but I need to respond to Richard Dawkins's article, "You Can't Have It Both Ways: Irreconcilable Differences?"

I see nothing cowardly or intellectually flabby in having a respectful coexistence with religion. It has its place, just not in the sci-

ence classroom. Intelligent believers—and that is not an oxymoron—understand that.

Why should we respect religion? Here's a few suggestions:

1. It is a source of comfort, particularly in the face of tragedy. I saw this first hand when a friend suffered a fatal attack at a social gathering. We were a mixture of pagans, Jews, a couple of Christians and, as near as I can tell, only one agnostic. All about me, my friends comforted each other with statements like, "He's with his grandmother now" and "He's up there now, waving at us," and even "He reached Valhalla before us." So, should I have tried to squelch these crumbs of comfort by telling them that our friend was irrevocably dead, never to be seen again in this world or the nonexistent next one? If anything, my grief was worsened by the loss of faith, and I would not have wished that on the rest.

2. Religion provides a foundation of moral character. Yes, Mr. Dawkins, I know all about the bloody injustices and the cruel laws that exist in the Bible. As an avid reader, I was tearing through the Old Testament by the fourth grade. I used to dig out all sorts of horrors and bring them up in Sunday School, which would disturb the teachers to no end ("That's interesting, Beverly, but today we're talking about Ruth and Boaz.")

The point is, as Mr. Dawkins says, the religious teachers did pick out only the nice bits to reinforce their message—but at least they had a message to give, a message that didn't seem to get spread in any other organized way. In all my years of growing up, Sunday School is the only place where we gathered regularly to talk about how we were supposed to behave, how to be good and kind and honest.

Somewhere in my teens, I rationalized God out of my life, but the behavioral training still took. The same *could* have been offered in a secular setting, and it probably should be. But until ethics becomes a regular course in the schoolrooms, taught from pre-school on up, we must look to the churches, synagogues, and mosques to do the job. (Leaving it to the parents is too haphazard. Too many of them are in need of such training themselves.)

3. We should forebear from unnecessary attacks on religious beliefs because we have no reason to be unkind. Someone called religion a crutch, and to many, I'm sure it is. But what kind of person would kick the crutch out from under the cripple?

4. With the notable exception of the creationist movement, I don't see religious claims acting as a threat to science. For instance, I have never heard of a paternity suit being settled by the ruling that this was another case of virgin birth, on the grounds that it must be possible because it happened once before, or of a coroner hedging his bets on the time of death because the corpse might have been briefly under the heavenly influence and therefore failed to decay on schedule. Allegations of miracles are not accepted as evidence. They have no bearing on anything or anyone except those who believe on the strength of faith alone.

5. My last reason is a selfish one. My one great passion in life is music. I live surrounded by glorious sounds. Opera is my favorite, but sacred works are not that far behind. For treasures like Gounod's St. Cecilia Mass, Beethoven's Missa Solemnis, Verdi's Requiem and Mozart's Vesperae Sollennes de Confessore, I could put up with any amount of silliness.

Bev Kaufman
Sunrise, Fla.

*As much as we would like to continue this forum indefinitely, space will not allow us to do so. We may publish a few more letters on the subject in a future issue but will need to get on to other matters. Additional letters may be found at our Web site, http://www.csicop.org. Thank you for your deep interest.*—THE EDITOR

# LETTERS TO THE EDITOR

## Alternative Medicine Arguments Fueled by Illogic, Lack of Information

The May/June 1999 letters column printed five letters responding to Drs. Angell's and Kassirer's reprinted *New England Journal of Medicine* editorial—all critical. The letters were intriguing because even sophisticated readers of SI are felled by illogic, lack of information, and their own hostile, "alternative medicine" attitudes. They were disturbing because of their poor understanding that "AM" promotes personal and unreliable emotional experience over knowledge and reasoning.

While the editorial contained some statements only partially correct ("alternative" methods have not been tested, advocates avoid testing), the obvious message was lost on the quasi-skeptic correspondents. "AM" advocates make false representations, decline to disclaim in the presence of disproof, engage commentary from a largely emotional and anti-intellectual framework, and submit to commercial promotion without supportive proof (scams). Charges against the *Journal*'s editors and bashing the "medical establishment" avoid the issue.

E. Frauenglass proposes Federal support for testing nonpatentable herbal and "natural" products in order to satisfy FDA regulations. Of the thousands of chemical compounds in nature, in thousands of plant species, which claims would be most appropriate to test? Those from thousand-year-old systems, or ones made up yesterday by enterprising neighbors on the Internet? And test for which conditions? And compared to which standard therapies? Or test in which combinations (that increases the possibilities logarithmically?) The idea might work in a world of infinite time and funding. At $200–300 million each, to test only one hundred herbs just once would cost $30 billion in taxes. If ten percent are found useful, that's $3 billion for each substance for just one study each. Some bargain, that proposition.

R. Blois regrets the "misinformation and many unfounded attacks on so-called alternative medicine." As proof of the legitimacy of "AM" he displays his own experience with PC-SPES, a product of Chinese herbs with estrogenic activity, which he apparently takes for prostate cancer. "What the authors did not mention is that it also has properties that alter testosterone levels and thus slow the rate of cancer growth in the prostate." What Mr. Blois apparently does not know, and that Drs. Angell and Kassierer and most physicians do, is that any estrogenic substance lowers testosterone secretion in men by inhibiting pituitary secretion of the stimulating hormone. Bloise then says "[PC-SPES] has cancer-controlling properties that go far beyond its estrogenic activity." He accuses the editors of making unsupported statements (see below) . . . but there is no proof for his statement.

Blois contests the editorial's statement that PS-SPES is promoted as bolstering the immune system, writing "Yeah? Where is it promoted as such?" "Where" is made clear in the references and in the "AM" boosting magazine, *Alternative Medicine Digest* (November 1997). It had already been made clear that certain claims cannot be made on the label, where Blois looked.

Blois also contents that PC-SPES ". . . can replace traditional hormone blockade . . ." without producing hormone resistance. There is no proof for such a statement, and of

course, no reference. The rest of Mr. Blois' letter is a list of objections to word usage, without any substantive proof given for most of his claims.

W. Holliday startles us with, "[The editorial] can hardly be said to have been written by unbiased individuals." This common error equates a negative opinion reached through knowledge and reason as being "biased," a favorite technique of aberrant medicine advocates and postmodern models of argument. He goes on to repeat the mantra that it cost $300 million to get a drug through FDA approval. But it is easier to donate $300,000 to political campaigns, and simply change the laws (Hatch-Richardson's DSHEA, 1994) to allow free marketing of products as herbal supplements. That is exactly what herb entrepreneurs did. The other alternative is to cease making unwarranted medical claims disguised as "health" effects, and treat the public to honest marketing.

L. Cline errs by accusing the editors of using "the same brainwashing techniques that the SKEPTICAL INQUIRER and the article . . . denounce." As illustration, Cline equates anecdotal claims of effectiveness for supplements with the well-researched and detailed case reports and analyses in the *New England Journal* issue. That issue also reported on the high incidence of adulteration of Asian herbal preparations with lead and other substances, lead contamination of an Indian homeopathic remedy, and numerous unwanted effects of other supplements. One does not have to go to medical school to "get brainwashed" to be able to tell the difference between good science and pseudoscience, between a detailed case study and a personal anecdote. In case of persistent resistance, the simplest example is the difference between a detective's murder investigation and the murderer's alibi.

Finally, R. Tripician relates that after seven years of Mevacor and about six months of dizziness, he stopped the drug and improved, and found "dizziness" listed among reported side effects. That experience, though suggestive, is not proof of a side effect of the drug. In fact, dizziness after seven years of lack of side effects would direct most physicians to consider other causes. Almost all drug side effects include dizziness, since any unwanted symptom occurring while on a drug is reportable to the company or to the FDA. It is then included in the drug's description—whether or not the drug was the cause. Tripician's experience has little to do with why people take "alternatives." That has more to do with personalities, politics, and advertising than with drug effects or perceived physician error. Nonskeptic and quasi-skeptic readers often comment in SI. But few have their minds changed by accurate information. Does that come as news?

Wallace Sampson, M.D.
Los Angeles, Calif.

*(Wallace Sampson is editor of the* Scientific Review of Alternative Medicine.*—ED.)*

## Where Are the Female Voices of Skepticism?

I just completed reading the July/August 1999 SI, and through the entire magazine was myself wondering, "Where are the female voices of scientific skepticism?" when I read Frederick Crane's letter admonishing SI that inclusion begins at home.

As a woman in midlife embarking on a graduate degree in geology who considers herself a critical thinker, I think I know where the difficulty lies.

While women may no longer be excluded from the physical sciences to the degree they once were, the hard sciences still very much show a male sphere of influence, which must be quite daunting to young women, as it is to me, even after many years of work in traditionally male jobs. There are just so many physics problems based on sports, military, aircraft, automotive, and construction topics (all things one would assume men have some familiarity with or interest in, beyond the assignment) one can stand before wondering why household applications or the mechanics of macroscopic nature are rarely mentioned. The same is true of advanced math texts. For example, what interest would I have in figuring the exponential growth rates of basketball salaries or the probabilities of someone pitching a no-hitter? Without text that can hold the interest of girls and women by including real-world problems where they have some familiarity with the subject, I suspect the failure rates due to lack of comprehension result in much eventual movement of smart women to fields more on the social side of the sciences, a fact which is indeed reflected in the professional listings of the women on your Committee.

While science has no gender, I do think boys and girls are still socialized to think differently, and the thinking skills and patterns of women are less likely to be based on standard deductive logic *a la* Sherlock Holmes. Other forms of equally valid scientific inquiry (induction leading to rigorous investigation, for example, or weblike associative ranging, often leading to novel insights, which can then be confirmed or denied by experiment) are still somehow seen as inferior to linear thought, by persons whose thought processes are confined by the latter method. One gets put in the position that to do science, not only must you be thorough, skeptical, and methodical, your method must conform to a method of thinking that is not native to most women.

Where are the women scientifically minded skeptics? They are somewhat skeptical of the whole game, and opt out. This is a shame, since the insights that could be brought by these women (and passed along to their nieces, nephews, and children, instead of the pablum of pop culture) could have a very decided effect on the next generation.

Jo Schaper
Pacific, Mo.

## Psychic Irony

After reading the News and Comment article "FBI Enlisted Psychic in TWA 800 Investigation" (July/August), I recalled a recent article in my local newspaper that pointed out the importance of listening to psychics in a criminal investigation.

While investigating the abduction and probable murder of a local girl from an all-night convenience store, Terry Smith, an investigator with the Minnesota Bureau of Criminal Apprehension, was heard to comment on the role of psychics in the criminal investigation, "When you talk to your first psychic, it's interesting. After your 100th psychic, you're less impressed. They always say something vague, such as, 'I see a field with flowers.' Just once, I'd like one to give me an address."

When asked why the bureau was wasting investigative resources following up on the leads that psychics provided, he remarked, "Because it could really be the suspect or his wife or girlfriend, trying to tell you where the body is."

So don't sell psychics short, they sometimes *do* solve cases, although in the most deliciously ironic way.

Lar Nachtwey
Lake Elmo, Minn.

Due to the volume of letters not all can be published. Address letters to Letters to the Editor, SKEPTICAL INQUIRER. Send by mail to 944 Deer Dr. NE, Albuquerque, NM 87122.

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AT THE CENTER FOR INQUIRY–INTERNATIONAL (ADJACENT TO THE STATE UNIVERSITY OF NEW YORK AT BUFFALO)

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## THE COMMITTEE FOR THE SCIENTIFIC INVESTIGATION OF CLAIMS OF THE PARANORMAL

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**Center for Inquiry—Moscow**
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The Committee for the Scientific Investigation of Claims of the Paranormal encourages the critical investigation of paranormal and fringe-science claims from a responsible, scientific point of view and disseminates factual information about the results of such inquiries to the scientific community, the media, and the public. It also promotes science and scientific inquiry, critical thinking, science education, and the use of reason in examining important issues. To carry out these objectives the Committee:

- Sponsors publications
- Conducts public outreach efforts
- Maintains an international network of people and groups interested in critically examining paranormal, fringe-science, and other claims, and in contributing to consumer education
- Encourages research by objective and impartial inquiry in areas where it is needed
- Convenes conferences and meetings
- Conducts educational programs at all age levels
- Does not reject claims on a priori grounds, antecedent to inquiry, but examines them objectively and carefully

The Committee is a nonprofit scientific and educational organization.
The SKEPTICAL INQUIRER is its official journal.

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